SCIENTIFIC AMERICAN

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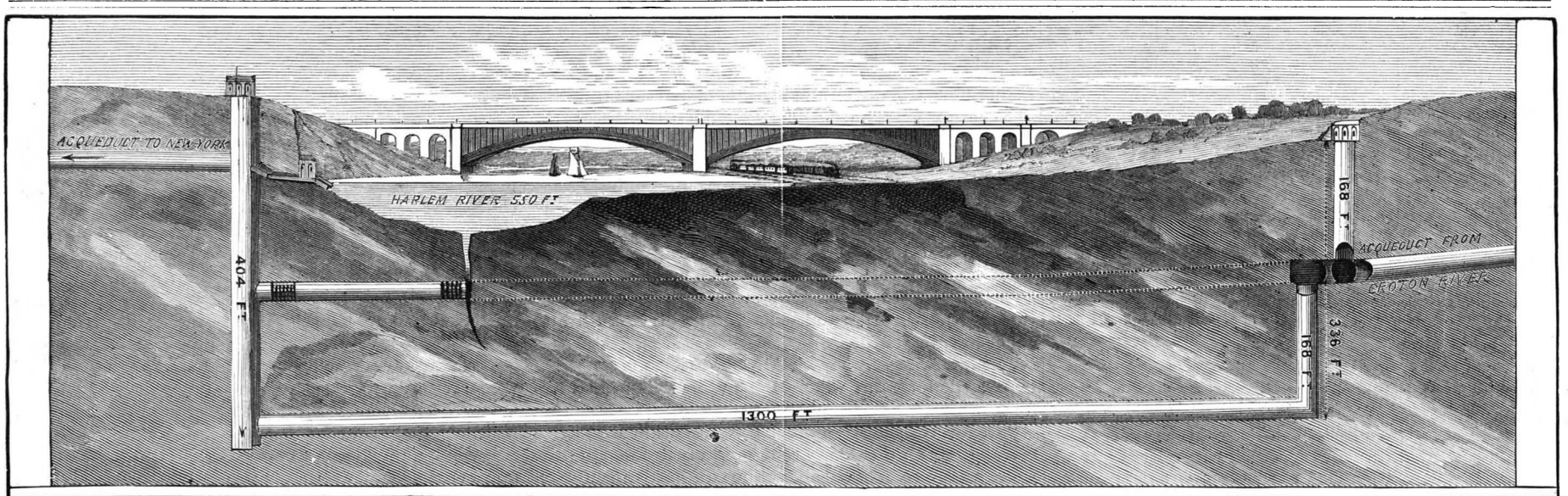

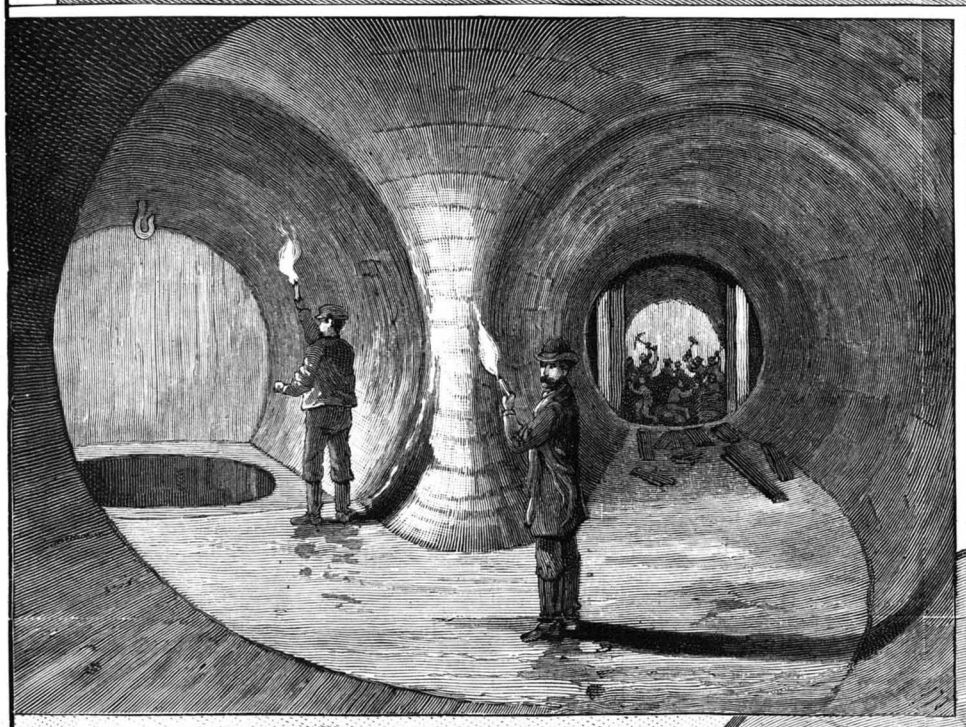

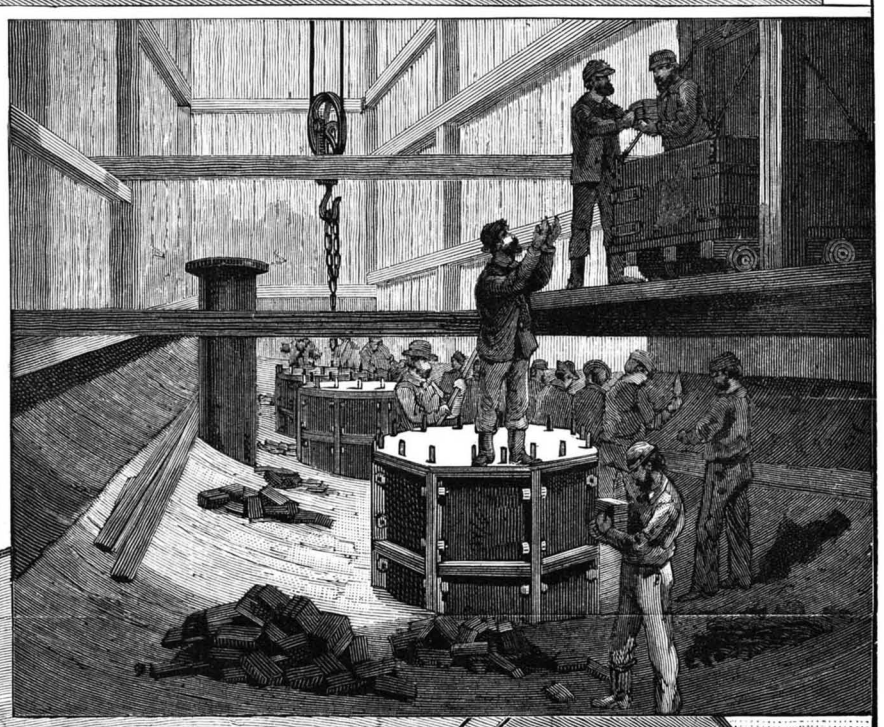

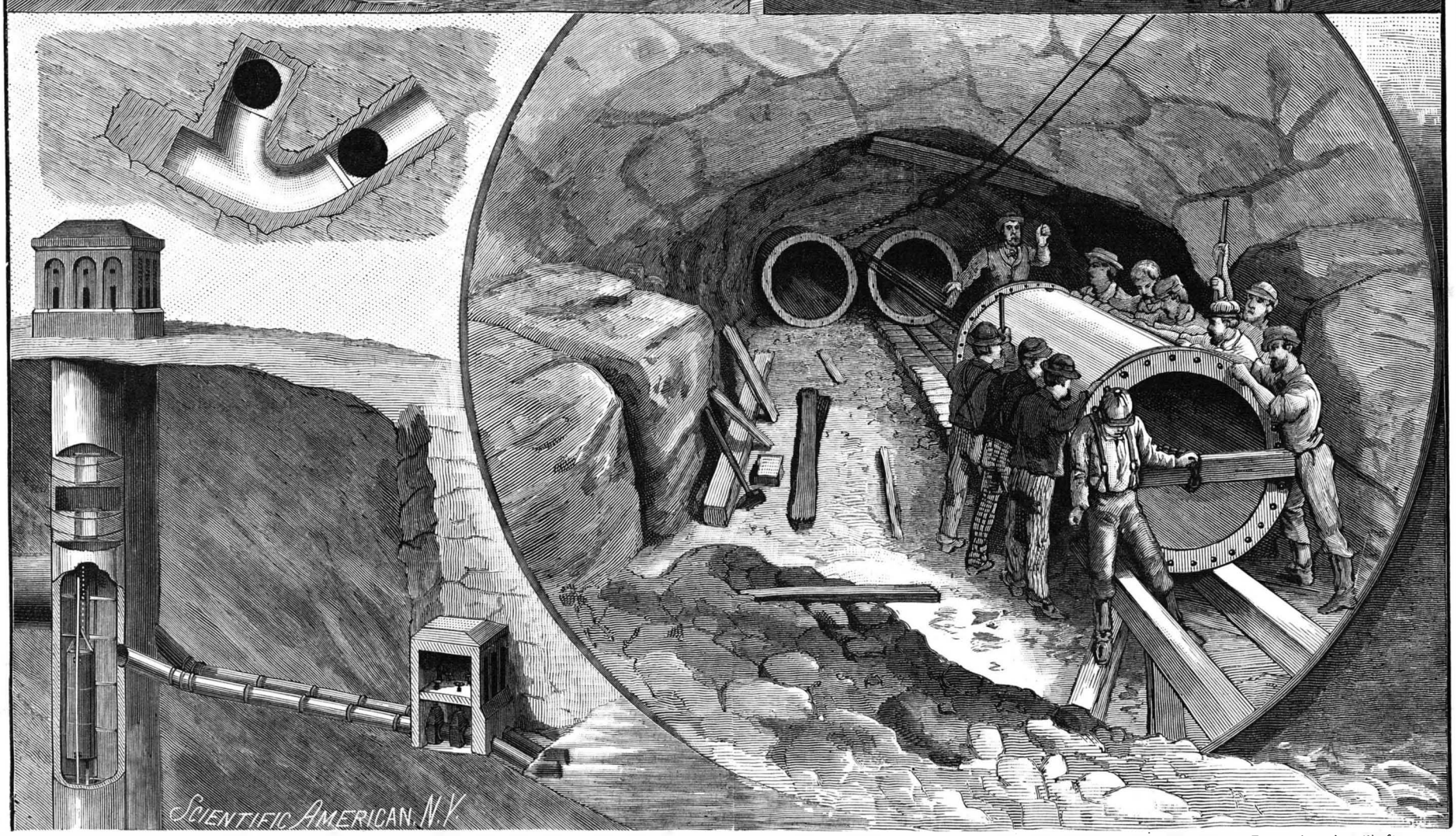

1. Longitudinal Section of Tunnel and Shafts. 2. Perspective and Plan showing Difference in Alignment in Shaft, East End of Siphon. 3. Building Inverted Arches, Shaft 25. 4. Pump, Aqueduct Shafts, and Blow-off; building Blow-off.

THE NEW CROTON AQUEDUCT TUNNEL UNDER THE HARLEM RIVER.—[See page 165.]

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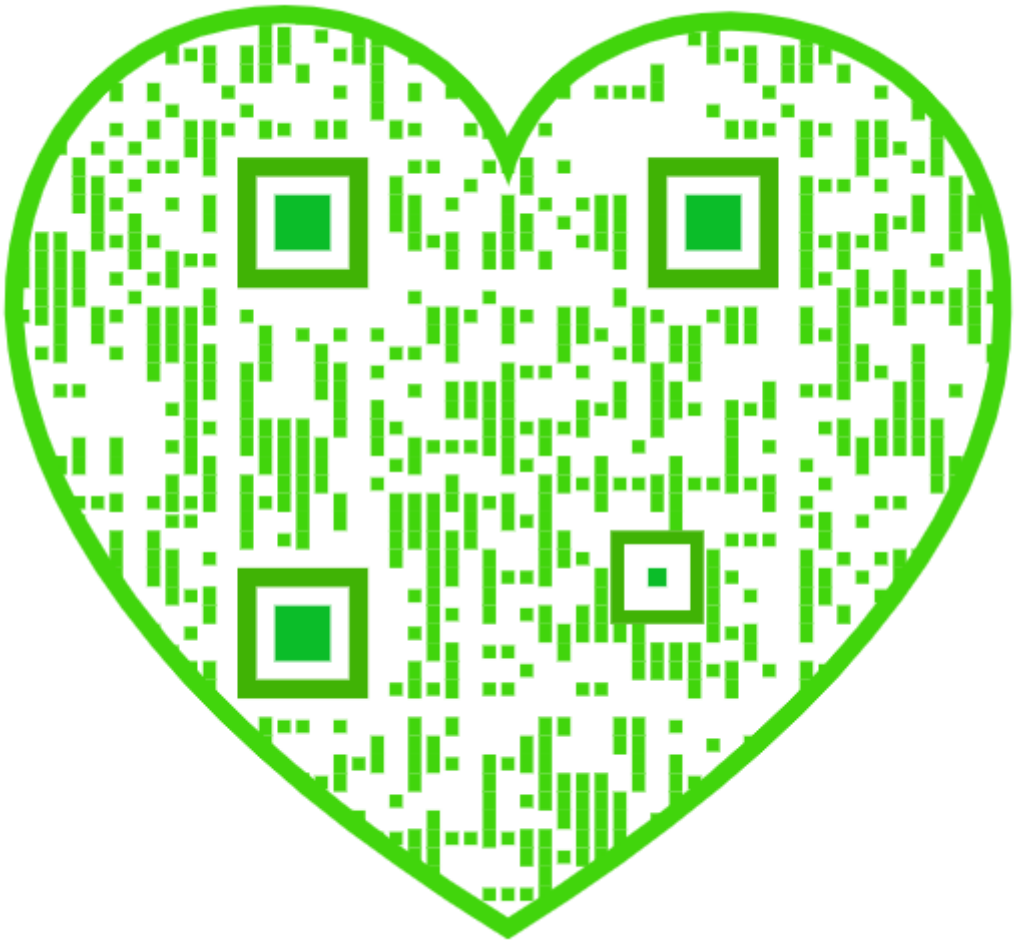

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THE NEW JET BOAT EVOLUTION.

A few weeks ago we gave an account of the new experimental 100 ft. boat Evolution, which is to be propelled by a high pressure water jet, and from which greatly improved results are expected by Dr. Jackson, the projector, and his friends. The propulsion of boats by expelling a jet of water from the stern is a very old idea and has often been tried, but heretofore with loss of speed as compared with the ordinary screw or wheel propeller. In all of these jet experiments, a large jet of water has been used at a comparatively low velocity. Jets varying from 5½ feet area to 7½ inches have been used.

In this new boat, the Evolution, now nearly ready for trial in this harbor, the propelling jet of water is to be only three-fourths of an inch in diameter, delivered under the enormous pressure of 2,500 pounds to the inch. This is a novel and striking departure from the old methods. The builders confidently expect the new system will revolutionize the art of steam navigation and render useless the employment of the present cumbersome forms of marine engines, propelling screws and wheels. That a tiny stream at high pressure should be more effective in propelling boats than a large stream at low pressure is generally denied by the best engineering authorities. The new boat has been constructed to work in almost direct contradiction to the theories and calculations of Rankin and other naval scientists.

The following, by Mr. S. Alfred Varley, may perhaps be regarded as an explanation of the scientific basis upon which the new enterprise rests.

"In the transmission of energy hydraulically, there is a loss of useful energy arising out of the fact that the energy has to move the vehicle of its transmission bodily, and this general law would seem to prevail in all cases, viz., the higher the potential, *i. e.*, the greater the amount of energy to the weight of its vehicle, the more complete is the transmission.

"As an example of what seems to be a general law, consider the transmission of energy mechanically by means of a long wire passing over pulleys and moved rapidly in alternate directions; the overcoming the inertia of the wire and the pulleys, and the friction encountered, will consume energy. Let it be assumed the waste from the above causes equals 50 per cent of the energy, if the wire and the pulleys can be reduced to half their weight, the inertia and the friction will be correspondingly reduced, and 75 per cent, instead of 50 per cent, would be transmitted.

"The same general principle to that above mentioned, in reference to the transmission of energy by means of a wire, holds good with hydraulic transmission, and also with steam engines.

"When energy is transmitted to a distance hydraulically, the greater the amount of energy associated with the water moved, in other words, the higher the potential or pressure employed, the greater the percentage of energy transmitted and developed as work at the distant station."

THE SCIENTIFIC MEETING AT TORONTO.

The American Association for the Advancement of Science proves its continental character by occasionally crossing the line into Canada, and whenever it does so, it is sure of a hearty greeting. Nowhere has this important society met with a more cordial welcome. Toronto has 180,000 inhabitants, every one of whom believes the Behring Sea to be an open sea and the British flag to be the most glorious of all national emblems. And yet at the grand reception given to their guests, August 28, at the Pavilion in the Horticultural Grounds, they found a number of star-spangled banners, which they alternated with their own with beautiful effect. This was all the more appropriate because every State in the Union and every Province in the Dominion was represented in this scientific congress. It may be added that many of the master minds of the age were in attendance.

Conspicuous on the platform were seven individuals who had been honored as presidents of the Association, namely, Professors Dana, Hall, Barker, Newton, Dawson, Morse, and Mendenhall. In the absence of the retiring president, Major Powell, whose duties in connection with the reclamation of arid lands detained him, the chair was taken by the venerable Prof. Dana, who, after brief remarks, surrendered it to the president-elect, Prof. Mendenhall, recently of the Rose Polytechnic Institute of Terre Haute, but now at the head of the United States Coast Survey.

The Association was formally welcomed to Toronto by the mayor of the city, the Minister of Education, the Chancellor of the University, and other dignitaries. To these the chairman replied. Of course these speakers could hardly avoid making some reference, mostly in a humorous vein, to the existing complications between the two adjacent countries.

But Prof. C. S. Hill, vice-president of the section of economics and statistics, made quite a sensation by his opening speach on the "Relations of the Canadian States and the United States." He thought it remarkable that the former people should not unanimously desire annexation to such a progressive and enterprising people as ourselves. There can be but three Americas—north, central, and south; and eventually there will be but one people from the Atlantic to the Gulf, bound by inseparable ties of language and consanguinity. He denounced strongly the policy of free trade as long as Canada remained a part of the British empire, and contrasted the bitter racial and religious antipathies existing under a cold monarchical sway with the obliteration of such rivalries in a republic. And so he went on to prove conclusively that "there is no future for Canada but in union with the United States, which is to-day the first in industry, education, and wealth among the nations of the world"—all of which is doubtless true enough, but of a nature to provoke sharp criticism from the Toronto pres.

The other opening addresses before the several sections were on less exciting topics. Prof. Woodward addressed the section including mathematics and astronomy on the "Mathematical Theories of the Earth," as to its shape, size, constitution, distribution, of its mass, internal heat and secular cooling, crust movements, and sundry theories of cosmogony. Prof. Carhart, before the section of physics, reviewed the "Theories of Electrical Action." Electrical applications increased so rapidly that only experts could keep pace with them, although they awoke universal popular interest. He expressed the hope that electricity and magnetism might yet be obtained from sunlight. He gave a retrospective view of work done by electricians during 225 years, most of which period was barren. Maxwell's translation of Faraday's ideas into mathematical language, 16 years ago, marked an epoch. Nothing further seems to be necessary to prove the electro-magnetic theory of light than the astounding facts that electro-magnetic waves are reflected from the walls of a room, and that an iron post casts an electro-dynamic shadow. Electricity annexes the domain of light and radiant heat. Henceforth, luminiferous ether must always have place in language describing electrical phenomena.

In the section of anthropology, the opening address by Vice-President Garrick Mallery was an effort to show a strong similarity between the Israelite and Indian races. He discussed their ideas of religion and planes of culture, announcing the fact that revelation, which is usually claimed as antedating religion, is the last step in its evolution, being the point where the mind clings to faith as a final refuge from doubt, that is for so many the synonym for despair.

In the chemical section, Prof. Dudley, of Nashville, discussed "Amalgams." His paper was highly technical. He asserted that work done hitherto on amalgams was very desultory, zealous investigations being usually cut short with lame results, whereas it is vitally important for us to continue our own lines, as well as those begun by others, to legitimate conclusions.

"Protoplasm, or Living Matter," was the theme on which Prof. G. L. Goodale opened the biological section. He said that the term protoplasm was familar to all. He reviewed the history of researches as to cellular tissue from 1667 down to the present time. Cohn and Unger have shown that the protoplasm of vegetable cells was identical with what had been already observed in animal structure. Recent observers have made fresh examinations throwing light on the mechanism of its movement and its mysterious power of spontaneous motion.

The address before the section of geology and geography, by Prof. C. A. White, was on the North American Mesozoic, a subject he has made his special study. The rocks occur along the Atlantic and Pacific coasts as well as in the interior, and rest unconformably upon various formations. The Atlantic Mesozoic consists of a representation of the Upper Trias of Europe, the Upper Jura, and Middle and Upper Cretaceous.

The Mesozoic rocks are so widely separated that, as we go westward by way of the Gulf States, we find none till we face the 100th meridian. No Triassic rocks exist within the 30,000 square miles of Texas and the Indian Territory which some geologists say are wholly occupied by such rocks. The "red beds" upturned against the Rocky Mountains, which by common consent have been referred to the Trias, and are several thousand feet thick, are non-marine and as a rule barren of fossils. The evidence is meager to prove their Trissaic age. The break between that age and the Paleozoic of North America occurred while the living forms of the latter were far in excess of the former. Hence the Mesozoic limit must coincide with the earlier or later Trias. We are unable to designate closely its upper limit in the interior and Pacific regions, but in the Atlantic coast region it is where the marine Eocene rests on the Upper Cretaceous. The speaker in conclusion advanced certain propositions which involve the common methods of paleontologists, who assume to be able to determine precisely the age of any and all fossils without reference to stratigraphy, and who also use European classification as if it were of infallible application to all other parts of the world. The formations of any given continent ought to be first investigated with relation to each other, and afterward in correlation with those of other continents.

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Major J. W. Powell's address as the retiring president (read in his absence by Prof. Gilbert) was heard by a vast audience convened in the Pavilion. It was on the "Evolution of Music—from the Dance to the Symphony." It was an hour and three-quarters long, and abounded in learning, wit, and poetry. Indeed, the remark was made by one of his illustrious predecessors, in whose footsteps he did *not* tread, that the address would have been more suitable for an association for the advancement of poetry than of science. Among the things said by Major Powell were these: The laws of biotic evolution do not apply to man. Human classification is by culture, and culture is the product of endeavor. Of this the evolution of music is an illustration. In it there is no survival of the fittest, for many a screaming soprano holds her own in opera, and many a wretched fiddler ranks as first violin in orchestra. No adaptation to environment, for many a choice musician comes from families where music is lightly prized, while thousands of dollars are vainly lavished on those that "have no ear." A Jenny Lind or a Nilsson will sing as sweetly in Louisiana as in Sweden.

The fact is that music is the invention of mankind. There are four germs for the four fine arts. Fetish carving is the germ of statuary; tattooing of painting; mythology of the drama; and the dance of music. All art is symbolic. How did music grow? The rhythm of motion became the rhythm of emotion. The rock-leaved bible of geology tells us of the sylvan man who moved in figures of harmony while his voice kept time. Then came stress. Then pitch. The egg of poetry was laid, and of melody; for they were both born of the dance chant. At last the child is emancipated, and music is no more chained to terpsichorean feet. Savages see mystery everywhere and people earth, air, and sea with gods, whose acts are presented in the drama. Even in civilized lands the highest and best men ponder the problems of creation; and the mythic dramas of savage life become the oratorios of the Christian. Harmony is the combination of melodies; and symphony is a sequence of harmonies. Science comes to make music sublime. Instruments are made that go beyond the limits of the voice and thus enrich all occasions.

From the primitive fire-light dance come the folk-songs, cradle-songs, love-songs, war-songs, songs of patriotism and songs of Christian hope. Music thus comes to be the language of the soul as stirred by the glories of the universe. Is there a new music of the future? Science says yes. We know that music has been chained to form and imprisoned in the Bastile of musical intervals and guarded by the henchmen of dogmas. But a few great composers, like Wagner, have broken the chains, and burst the bars and killed the gaolers, and they sing their liberty in strains of transcendent music.

THE SEWAGE DISPOSAL PROBLEM.

As cities increase in size, the problem of sewage disposal becomes a more and more difficult one to solve. The English sanitary engineers, with a densely populated country, including the largest city in the world, as a field for experiment, have probably performed more experiments on an actual working scale than have those of any other nation. Chemical treatment has been tried in an endless variety of forms. The A B C process, named from the initials of the substances used in carrying it out, alum, blood, and charcoal, at one time had an extensive application. Now the tendency is toward the use of chemical salts alone, aluminum, iron, and calcium compounds being most in favor. Precipitation is assisted by the addition of comparatively small amounts of these salts, perchloride of iron, alum, milk of lime, and others being in use in various places. After treatment with chemicals, the sewage is left at rest to deposit its solid matter. The effort is to obtain the latter in as compact a form of "sludge" as possible, and during its precipitation to deodorize the liquid portion, so that it may be disposed of without offense.

The engineers interested in this problem seem to have had very Utopian ideals. Their object has been to dispose of sewage without offense and at the same time profitably. The first of these ends is easy of attainment, the latter is probably impossible to achieve. The great problem is how to separate liquid and solid. This once done, the solid can be desiccated and disposed of as easily as ashes or any other form of refuse. The liquid can be used for irrigation.

Where chemicals are not used, the separation can be effected mechanically. Upward and downward filtration may be used in connection with and supplementary to settling in subsidence tanks. The trouble in purely mechanical treatment is the odor of the effluent water. A proper and sufficiently thorough application of chemicals only can remove the odor. The necessity of perfect deodorization is most felt in the case of towns and cities in the interior. Dilution is a great panacea for this trouble, but is only practical near large bodies of water. Inland cities have to produce as clear and innocuous a filtrate as possible. Mechanical filtration alone will not effect the desired result.

In England the disposal of the effluent from filtration or precipitation is conducted by irrigation to a very large extent. On the Continent the same system has been adopted, notably in the case of the city of Berlin. Overground irrigation upon plowed fields seems to be very effectual. In this country subsoil irrigation is used in an immense number of localities, principally by private houses and hotels, and meets with excellent success.

The sludge or solid matter remains to be got rid of. The constant effort to make sewage farms profitable and to make sewage a source of revenue to the corporations of cities producing or disposing of it, has to a certain extent caused an erroneous view to be taken of the matter. The conclusion is gradually forming in the minds of engineers that sewage sludge is of little value. The hopes so long entertained of putting it into a marketable form, so that it would be in demand as a fertilizer, seem doomed to disappointment. From many places the same story comes; that sewage works are a source of expense, and that the sludge, fortunately very small in amount, is of practically very little or no value. In London the same attempt has been made to profitably dispose of the solid matter, but it has had no success. It was collected and pressed into blocks at a cost of 4*s*. 6*d*. a ton. In this form it could not be sold at even a nominal price. Farmers would have none of it. Pressing was abandoned, and some of it is now delivered in the wet state as compactly as possible into tank steamers. In this way some three thousand tons a week are carried beyond the Nore and are deposited in the German Ocean. The cost is put at 6*d*. per ton. This is by no means all of the solid matter of the London sewage. A great quantity still goes into the Thames, polluting its waters. In the case of a vessel that went down in the river below London, some years ago, it was related that the death of some of the passengers was caused by the poisonous exhalations from the water rather than by simple drowning.

Sludge from a chemical precipitation works in the neighborhood of this city was recently tried upon a farm in comparison with ordinary manure. The conclusion reached was that it was of more harm than good, and that the land without manure did better than that which received sludge alone.

This, then, may be said to be the present aspect of the sewage problem. Money must be spent to get rid of it. The efforts of engineers should be in the direction of economical disinfection and deodorization; profit should be out of the question. The problem is one of growing importance. If the facts above outlined are realized, the problem will be more effectually grappled with than where the idea of sewage having a monetary value prevails.

The Mexican Tuna.

In the *West American Scientist* Mr. Edward Palmer writes entertainingly of the fruit of the opuntia, or *tuna*, as it is called in Mexico, where it forms the principal article of food for many of the natives during several months of the year. The tuna of the Mexicans must not be confounded with the opuntias found in southern California and Arizona. Many valuable varieties of opuntia are found growing in the cactus belt of Mexico, and seeds of some of the most desirable were furnished originally by the United States Department of Agriculture. When new varieties are produced by artificial crossing and selection, as great improvement may be expected as has been made with other cultivated fruits, but the different varieties now have no distinctive names. This cactus requires little care, and thrives on almost any soil, but it reaches its best condition on the table lands of Mexico. A piece of the plant laid on the surface of the ground will take root and grow; it will endure considerable cold, and the most protracted drought only seems to increase the sweetness of the fruit. When gathered, the fine spines on the surface of the fruit must be removed, so that it can be handled without inconvenience. The skin is then removed, leaving the pulpy meat exposed in a most tempting manner. It is specially adapted to the breakfast table, having something of the watermelon flavor, with a suggestion of strawberry. Tuna is abundant and cheap in the market from June till November. It is finding its way along the frontier of the United States, and is already on sale in Jacksonville and other Southern cities.—*Garden and Forest.*

Egyptian Discoveries.

Before the Victoria Institute M. Naville recently gave an account of his latest Egyptian discoveries. The lecturer gave a description of his discovery of Bubastis, where he unearthed numerous inscriptions dating back to the Fourth Dynasty, among others some referring to Cheops, showing that he reigned over all Egypt, some to the invasion of the shepherds or hyksos, who, from some of their monuments found, were clearly highly cultivated, and came from Mesopotamia. Among their statues unearthed were two of Apepi, the Pharaoh of Joseph, also inscriptions in regard to the Pharaoh of the Exodus, and others of high interest.

Albumen Transparencies.

Transparencies by the albumen process are still unsurpassed by those of any other, and it is in this direction that the process has mainly been employed since the introduction of collodion. The famous stereoscopic slides of the late M. Ferrier, made more than thirty years ago, are as good as, if not better than, any that are made now, notwithstanding all the modern improvements in photography. Indeed, even now, albumen transparencies are looked upon as the standard of perfection, for it is seldom that more is claimed for any process than that "it is nearly, or quite, as good as albumen"—never that it is superior.

A glass plate, after being carefully cleaned, is coated with iodized collodion of a somewhat porous or rotten character. It is then washed in water to remove the ether, alcohol, and iodide. After draining, the iodized albumen is poured on and allowed to soak well into the film. The plate is then reared on end to dry. By the way, all these operations may be conducted in open daylight. The collodion, it may be mentioned, acts purely mechanically, and takes no part in the formation of the image. The plate, when dry, is sensitized in a silver bath, strongly acidified with acetic acid. Forty-five grains of nitrate of silver and forty-five minims of acetic acid to the ounce of water are the proportions usually adopted. The plate is then washed and again dried. The exposure is generally made by contact printing. In the earlier days of the process the development was by means of gallic acid, but the more modern method is with acid "pyro," used warm. After fixing in hyposulphite of soda the image is toned with gold to the color desired.

The principal charm in albumen transparencies is the extreme brilliancy and transparency of the shadows. —*British Journal of Photography.*

A Spider-hunting Wasp.*

Not long since, while I was enjoying a siesta on the porch, my attention was suddenly attracted by seeing a very large spider running up the body of a tree about ten feet away. The spider seemed to be very much excited, and, after he had run up the body of the tree about six feet, he ran out on a side limb, and, after he had gone about eight feet out on this limb, he dropped off to the ground. No sooner had he struck the ground than he commenced a headlong flight through the grass of the lawn. After he had run about five feet on the ground, I saw a very large wasp, about two inches long, following the track of the spider on the tree. The wasp was running and flapping his wings in a nervous manner, but was not flying at all. In a few minutes the wasp arrived at the spot where the spider had dropped off, which, by the way, was about ten feet from the ground. Here the wasp became very much excited, and ran rapidly back and forth about a minute. Then he took flight, flew to the root of the tree, where I saw him at first, and ran up the track again. Soon he arrived at the jumping-off place, and again became very excited, running round and round, and flapping his wings nervously. Suddenly the wasp stopped, and appeared to be *thinking*. Certainly his actions bore out this conclusion, for he closed his wings and dropped off the limb, just where the spider had dropped. Arriving at the ground, he recommenced the search, and, after a few futile attempts, he struck the scent, and away he went, just exactly as a hound would have followed a deer. After running about ten feet on the ground, he overtook his prey.

The spider either saw or heard his enemy coming, for, without waiting to be overtaken, he threw himself upon his back, with his feet in the air, and in this posture awaited the attack. The wasp lost no time in beginning, but, to my surprise, seemed to be somewhat afraid of the spider. The wasp took to his wings, and would fly round and round the spider, and would now and then make a sudden thrust at him. The spider would, at these times, jump forward and seemed to be trying to catch the wasp. The wasp was too agile, however, to be caught. Suddenly the wasp made an attack, stung the spider, and in less than half a second the spider was perfectly dead. Electricity could not have killed him quicker. The wasp, after satisfying himself that his prey was dead, sat on the grass near by and proceeded to rest himself, for his violent efforts had exhausted him. After resting about two minutes he approached the spider, and, after examining him critically with his antennæ, straddled him, and proceeded to bear him away.

Just here I put in a say-so, and captured wasp and spider, and immolated both to my scientific curiosity. This occurrence would seem to show that the wasp can track by smell, and can likewise *reason*, else why did he drop from the limb? I regret to say that I neglected to keep the spider and observe whether he had been really killed, or only put into the lethargic condition into which our dirt daubers put their spiders.

I am not versed in entomology sufficiently to give the technical names of either wasp or spider. The spider was very large, his abdomen being about half an inch long.

* By L. S. Frierson, Frierson's Mill, La., in *Popular Science News.*

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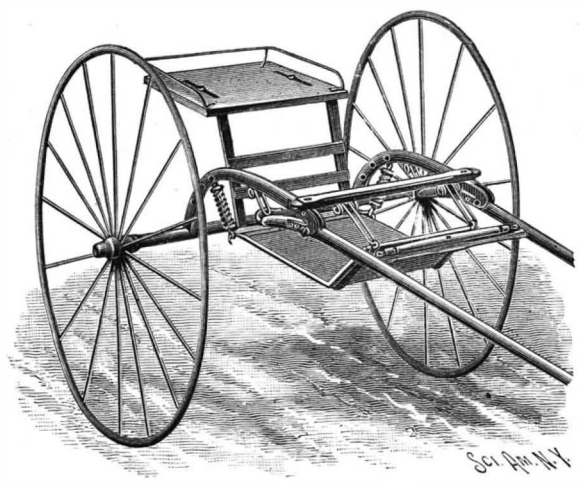
AN IMPROVED ROAD CART.

A two-wheeled vehicle designed to greatly lessen the disagreeable jogging motion ordinarily imparted by the movement of the horse is illustrated herewith, and has been patented by Mr. E. W. Doo-

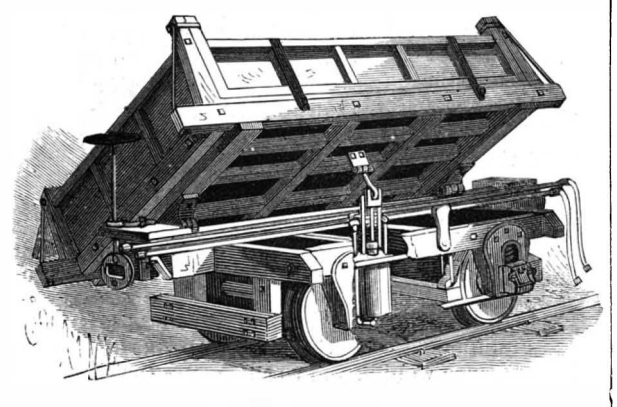


DOOLITTLE'S ROAD CART.

little, of Garden Grove, Iowa. By this invention short shafts, secured to the axle and supporting the seat, are pivotally connected with long shafts, springs being interposed between the long and the short shafts, and the lugs by which the pivotal connection is made have different apertures for changing the pivotal point to regulate the pressure on the springs. The latter are attached to the short shafts just back of the ends of the long shafts, on the ends of which they bear and are held in place by a hook-like iron strap. To a transverse beam connecting the ends of the short shafts are similar springs, which are connected at their other ends with the bent bars that support the platform or foot rest, these bars at the rear of the platform being bent upward and then rearward, where they carry the seat. The latter is slotted, and attached by bolt with thumbscrews, to allow for shifting it forward or backward as desired. The rear of the platform or foot rest is hung from the short shaft by means of a coil spring, such attachment being adjustable in different positions on the shaft by means of a ring bolt and thumbscrew, whereby the position of the spring may be changed according to the weight carried. The principle of this invention is also intended to be applied with a pole as well as with shafts.

AN IMPROVED DUMPING CAR.

A car arranged to be dumped from the engine, by means of compressed air or steam, is illustrated herewith, and has been patented by Mr. Joel H. Gearhart, of Leadville, Col. The car body is hinged to the platform or truck, and beneath the platform, to one side of the center, is mounted a vertical cylinder in which works a piston having an outwardly extending stem to which there is hinged a connecting rod or link, the outer end of this link being hinged to the car body. In connection with the cylinder are arranged two systems of pipes, a pipe from one system entering the cylinder above the piston and one from the other system entering the cylinder below the piston, and these systems are connected with a compressed air reservoir carried by the locomotive, or with the steam supply. In the two systems are arranged valves, preferably such as employed with the Westinghouse automatic brake, whereby, on the admission of steam or compressed air to the bottom of the cylinder, the piston will be raised



GEARHART'S DUMPING CAR.

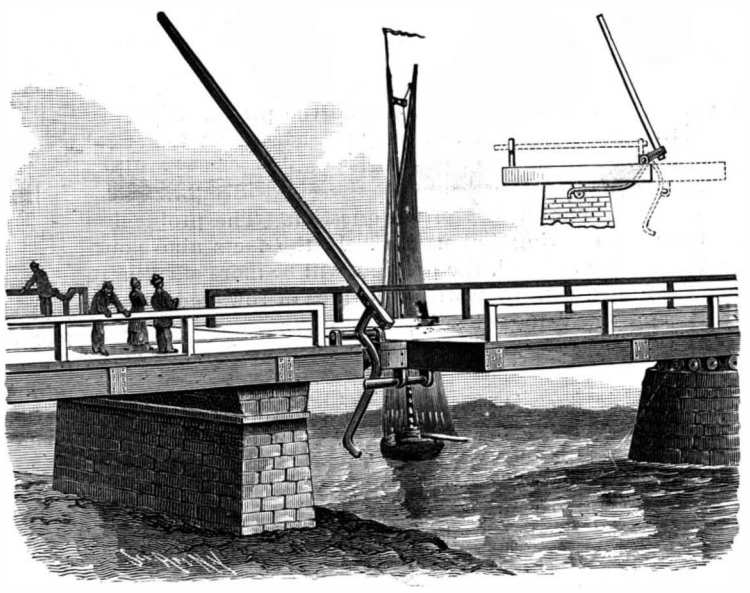
to tip the car body, as shown in the illustration, the car body being returned to its normal position by the admission of steam or compressed air to the top of the cylinder. Couplings are provided whereby any number of cars may be connected in such a system, and the engineer can dump the cars and return them to normal position while the train is in motion as well as when it is at rest.

Electric Force in a Derrick.

The *Progressive Age* relates an amusing exhibition of the magnetic force of electricity as given in Lynn, Mass., when seven workmen tried to remove a derrick against which an electric light wire was sagging. They grasped one of the guys and were unable to remove their hands. The foreman berated his workmen in the good old country fashion. He had never had experience with electricity before, and was at a loss to comprehend what had so suddenly bewitched his men. Every one of them was hanging to the guy rope with the energy of desperation, yet powerless to move it. The foreman grasped a guy, and then the real state of the case came home to him. He, too, was transfixed. The electric current found him an excellent conductor, and ran down through him into mother earth. The affair, which had been very amusing, was fast getting serious, when the connection was as suddenly broken. The guy, which had made all the trouble, dropped away from the electric wires and the men were released. No serious consequences ensued.

AN IMPROVED DRAWBRIDGE GATE.

The accompanying illustration represents a drawbridge gate which will close automatically upon the opening of the draw and will be raised to open the way across the bridge when the draw closes. This invention has been patented by Mr. Charles King, of New London, Ohio. To the under side of each end of the draw is secured a projection, which extends beneath the abutment, and upon the abutment, in suitable bearings, is mounted a rock shaft. This rock shaft is provided with a standard, to which there is rigidly connected a bar or gate frame, adapted to form a barrier, there being also connected to the rock shaft a downwardly extending curved lever, which extends into the path of the projection from the draw. When the draw is closed and the bridge open to travel, as shown in full lines in the sectional view, the projection from the draw is in engagement with the curved lever to hold the barrier or gate frame in raised position; but on the opening of the draw the projection rides from beneath

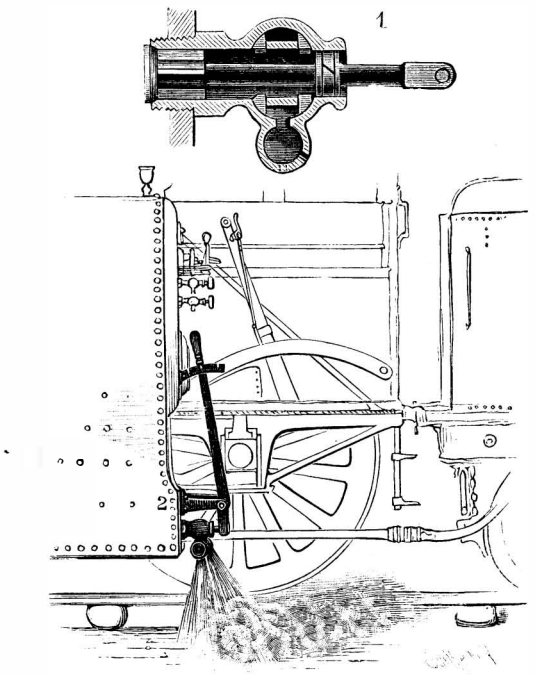


KING'S BRIDGE GATE FOR DRAWBRIDGES.

the lever, and the weight of the bridge bar or barrier carries it down to the position shown in dotted lines, to close the bridge to travel. A prop is provided on which the extended end of the bar or barrier rests when in position across the roadway, such a gate being arranged in connection with each end of the draw.

AN IMPROVED BLOW-OFF COCK AND FIRE EXTINGUISHER.

A device to be used on locomotives for cleaning the boiler, and at the same time serving to sprinkle wooden structures in the track, such as bridges, ties, trestles, etc., to prevent their being set on fire, is illustrated herewith, and has been patented by Mr. Lucius E. Michell, of Palestine, Texas. The device, shown in section in Fig. 1, is preferably secured to the lower part of the front end plate of the boiler, and has a valve body provided on its inner end with a valve seat leading to a longitudinal central opening. An inwardly opening valve is held on the seat, and has wings extending inward into the central opening, the inner ends of the wings being connected with a central valve stem, carrying a piston sliding in the central opening. The outer end of the piston rod is pivotally connected with an arm secured on a shaft mounted to turn in suitable bearings on the front plate, as shown at 2 in the main figure. On this shaft is also an upwardly extending lever carrying near its handle end a catch adapted to engage a notch formed in a segment projecting from the front plate of the boiler. In the valve body is an annular chamber connected at its bottom with a hollow offset, from the ends of which extend pipes in opposite directions across the lower part of the front end plate of the boiler, these pipes having downwardly opening apertures. The arrangement of the valve is such that by moving its lever into one of the notches in the segment, the water and steam from the boiler pass into the transverse pipes and are thrown down on

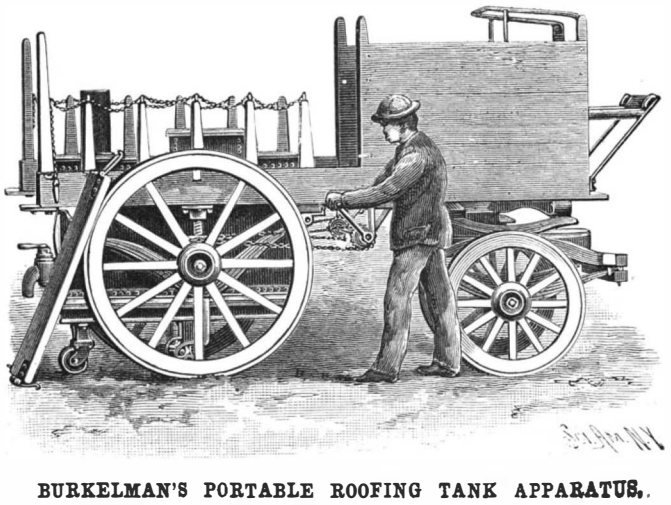


MICHELL'S BLOW-OFF COCK AND FIRE EXTINGUISHER.

to the track over which the locomotive is passing, as shown in the illustration, while by moving the lever to another notch, when it is desired to use the device as a blow-off cock, the larger part of the water and mud will pass out through the front open end of the valve body. For further information as to this invention address Messrs. Geo. M. Dilley & Son, Palestine, Texas.

AN IMPROVED ROOFING TANK APPARATUS.

An apparatus especially designed for transporting tanks or kettles for melting tar or other substances employed in roofing or sheathing buildings is illustrated herewith, and has been patented by Mr. Charles Burkelman, of No. 32 Sullivan Street, New York City. The apparatus includes a main four-wheeled truck, with its rear axle bent downward at the center to permit of the entry of a tank or kettle, for which there is an opening made in the rear part of the truck platform, there being a removable tail board to be applied after the tank is in place on the truck. The tank is supported at the place of use by a detachable truck, the bed of which has a general triangular form, and is sustained on a skeleton frame by two wheels at the front, and at the rear by a pilot wheel journaled in a bearing swiveled to a bracket bolted to the narrow end of the triangular frame. The bed is made of metal plates turned upward and inward at their ends to form hooks adapted to receive a flange formed at the bottom of the tank. The main truck is to be backed on to or around the detachable truck containing the tank, the main truck platform being cut away at each side of the opening for the tank to permit of its easy entrance. Four separate planks are provided to close this opening, and form a continuous platform, so that the truck can be used for general work when desired, these planks being also used as a re-enforce to the main truck platform to help sustain the tank in position for transportation, the tank having near its top opposite side flanges which rest on top of the planks. To lift the main truck platform and tank, when the latter is to be moved, the truck axle is utilized as a resistance piece or bar. Screws with threaded nuts are secured to the platform over the rear axle, and are stepped in recesses of metal foot blocks shackled to the horizontal end parts of the axle, these screws being preferably operated from either side of the truck by chain wheels in connection with a transverse shaft



BURKELMAN'S PORTABLE ROOFING TANK APPARATUS.

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sustained in bracket bearings bolted to the truck platform. Both ends of the transverse shaft are squared to receive the eye of a crank for turning the shaft and operating the screws to raise or lower the truck platform. The screws will ordinarily be turned to lift the platform and tank from three to five inches, or sufficient to take up the depression of the truck springs from the weight of the tank, when the detachable truck may be rolled out from under the tank and placed on the main truck.

RHEOSTAT AND RESISTANCE COLUMN.*

Besides the carefully constructed resistance boxes used in making electrical measurements, the electrician

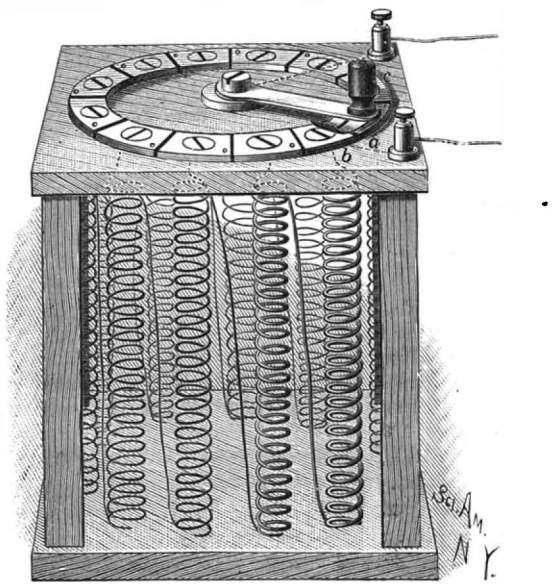


Fig. 1.—GERMAN SILVER RHEOSTAT.

requires adjustable resistances for heavy and light currents, which need be only approximately accurate. These instruments are also a necessity to the electroplater and to users of dynamos and batteries generally.

Fig. 1 illustrates a simple rheostat for heavy currents. It is designed to be introduced into the field magnet circuit or the external circuit as circumstances may require.

This rheostat consists of a series of German silver spirals arranged in a circle, beginning at *b* and ending at *c*. The lower end of the first coil is connected with the upper end of the second, the lower end of the second is connected with the upper end of the third, and so on throughout the series.

On the top of the wooden frame which supports the spirals is arranged a switch formed of a series of brass or copper blocks arranged in a circle and separated from each other by a space, and a swinging arm pivoted at the center of the box and carrying at its free end contact springs adapted to press upon the blocks.

The block, *a*, is isolated from the other parts of the rheostat, and serves as a rest for the switch arm when the circuit is open. The block, *b*, is connected electrically with upper end of the first coil, and the next block is connected with the top of the second coil, and through the straight wire with the lower end of the first coil. The spirals are all connected in this way.

The rear binding post is connected with the pivot of

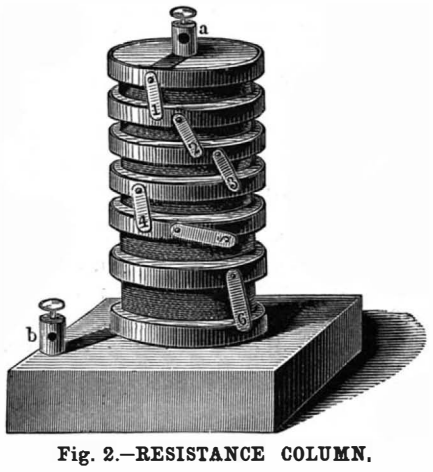


Fig. 2.—RESISTANCE COLUMN.

the switch arm, as indicated by the dotted line, and the one at the front of the frame is connected with the block, *b*.

When the swith arm is on the block, *a*, the circuit is broken; when it is on the block, *b*, the current passes from the farther binding post to the switch arm, thence through the block, *b*, directly to the first binding post without passing through any of the coils. When the switch arm is placed on the next block, the current passes downward through the wire connected with the lower end of the first coil, then upward through the coil to the block, *b*, thence to the binding post.

By moving the switch arm forward, the contact springs carried thereby are made to touch one block after another, thus introducing more resistance with each additional coil included in the circuit.

The first coil thrown into the circuit should be of heavy wire, say No. 14 or No. 16, and the second, third, and fourth should be somewhat smaller. The wire of the entire series of coils might be graduated to advantage if the various sizes required are available.

The resistance of German silver wire is about ten times that of copper. If German silver wire cannot be conveniently procured, iron wire may be substituted. In this case the coils will have to be longer.

Eisenlohr's column of resistance, shown in Fig. 2, is inexpensive and very convenient. It consists of a cylinder of mahogany or other compact wood, having six or more grooves cut in it. The cylinder is saturated with paraffine or varnished with shellac, and the spaces between the grooves are bound with brass bands. A little brass bar, turning on a screw, is made to extend from one ring to the other, as shown. These bars are slightly bent so as to press with some force upon the bands. Covered wire of a known resistance is wound in these grooves, the shortest length containing the given unit once or an even number of times.

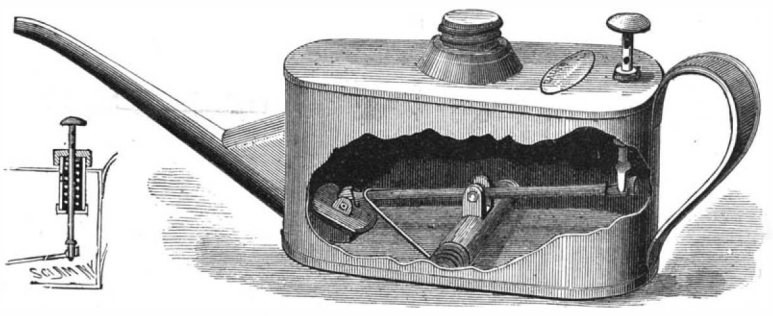
The length of the coils of wire in the successive grooves increases from 1 to 6; the ends of each wire are soldered to the two nearest bands, the upper band being connected with the screw, *a*, and the lowest with *b*. When this column is inserted in a circuit, the current passes from one ring to another through the bars, whose resistance is inconsiderable, but when one of the bars is turned aside, as shown in the engraving, the current passes through the intervening coil.

Coils of approximately 1, 2, 3, 6, 12, and 24 ohms resistance may be made by winding copper wire of the sizes and lengths given in the successive grooves as follows:

Ohms.	Ft.			Ohms.	Ft.		
1.....	37½	No. 24	Am. W. G.	6.....	56	No. 30	Am. W. G.
2.....	75	No. 24	" "	12.....	70½	No. 32	" "
3.....	28	No. 30	" "	24.....	140½	No. 32	" "
4.....	37¼	No. 30	" "				

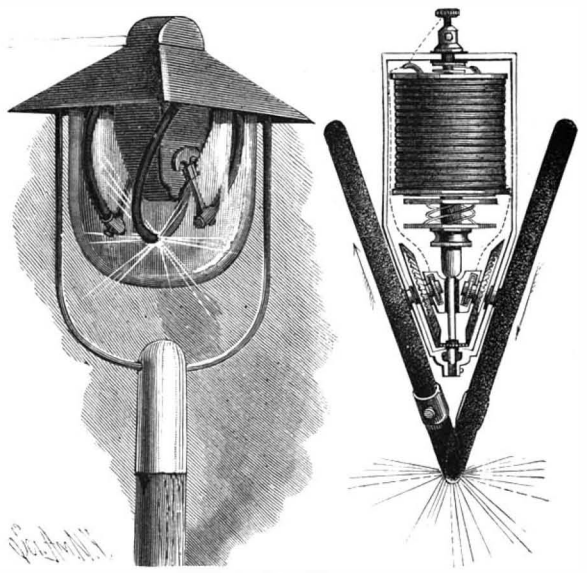
AN IMPROVED OIL CAN.

The accompanying illustration represents what is



THE RAU PATENT OIL CAN.

styled the "Perfection" oil can, of the Rau Patent Oil Can Company, Nos. 42 and 44 Michigan Street, Chicago, Ill. It is designed to save the time of the engineer and the mechanic using it, and to absolutely prevent any waste of oil. The construction of the can will be readily understood from the view given, the interior being shown within the broken-away lines, while the thumb piece by which the valve is operated is shown in the small view. The practical operation of the can is based upon the well known fact that, owing to the normal air pressure, the flow of any liquid from a closed vessel is almost entirely dependent upon the simultaneous admission to the vessel of a volume of air equal to that of the liquid discharged. Without such coincident admission of air, it would require a pressure of from fourteen to fifteen pounds per inch to force the liquid out of a closed vessel. In this can the admission of air to the interior of the can is effected by air holes in the push stem, by which the lever is operated to open a valve covering the inner end of the spout. The valve is mounted upon the end of a lever pivoted upon a center rest, the valves being made of polished brass, white metal, or leather, as preferred, or brass faced with leather, and are absolutely air tight, so that the instant the thumb pressure is removed from the button on the push stem, not a drop of oil can escape. The valve is firmly held to its place by lateral springs, made of a single piece of fine piano wire, coiled around the outer ends of the center rest for valve lever, the valve, the center rest, and the valve lever being all carefully grooved and fitted, so that the operation will be perfect and there will be no side motion lost. The end of the lever connecting with the valve is so made that no pressure is put on the rivet, the lever itself resting on the valve, and not on the rivet, when the can is closed, and should the valve become detached, it could not rest on the valve seat. The spring upon the push stem is of brass spring wire, so gauged and tempered as to retain its elasticity in any position, and it has a play of five-eighths of an inch, thus giving a similar play to the valve to allow of a full flow of oil when the stem is pressed down. With this can, no matter in what position it is held, the oil does not flow until the push stem is pressed down, affording great advantage in oiling parts of machinery difficult of access, where the engineer or machinist frequently has to waste oil, when using the ordinary cans, in order to reach the parts desired. Also on the removal of the pressure from the push stem the flow of oil instantly ceases, the amount



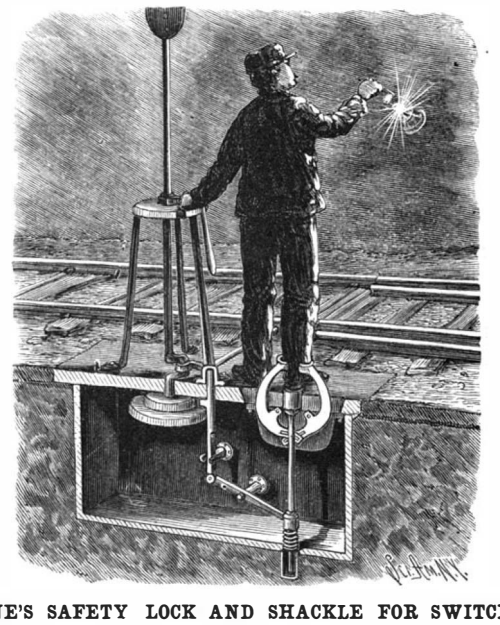
CARSON'S ARC LAMP.

[FOR DESCRIPTION SEE PAGE 164.]

of oil remaining in the tube being held there ready to drop immediately when the tube is again pressed, thereby effecting a great saving of time. The oval shape in which the can is made is said to give general satisfaction, and they are regularly manufactured of the best charcoal tin, although special sets are made to order of brass or other metals.

IMPROVED LOCK AND SHACKLE FOR RAILWAY SWITCHES.

The device illustrated herewith is designed to prevent the possibility of switches to sidings being left open by switchmen and train hands, providing for holding the operator at the switch until it is moved to a position to open the main line. This invention has been patented by Dr. William H. Caine, of Stillwater, Minn. The switching rails are connected by a tiebar that leads to a crank on the target rod, the latter being supported by a switchstand having an operating lever formed with a folding handle adapted to enter recesses in the table of the stand. Beneath the stand is a box or case, preferably of sheet metal, into which the lower end of the target rod extends, where it is connected to a disk having a notch or recess in its peripheral face. In connection with the disk is arranged a vertical locking bar, with a key adapted to enter the recess in the disk, the lower end of the bar being pivotally connected to a lever. This lever is fulcrumed horizontally in the case, its other end being connected to a vertical plunger, on one end of which is a spring abutting against the bottom of the case, the upper end of the plunger extending through the top of the case and carrying a step or platform. At each side of the plunger are pivoted shackles, with inwardly extending arms, and jaws which close as the plunger is depressed, and open as it rises. To open the way to the siding, the switchman places his foot on the step, when the depression of the plunger causes the shackles to grasp his ankle, and the simultaneous lifting of the locking bar at the other end of the horizontal lever lifts the key out of engagement with the disk connected with the



(CAINE'S SAFETY LOCK AND SHACKLE FOR SWITCHES.

lower end of the target rod, when the switch rails may be turned, and may be locked in such position by turning the handle of the operating lever downward to enter a recess in the table of the stand. The shackles

*From "Experimental Science," by Geo. M. Hopkins. In press. Munn & Co. publishers, New York.

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will thus be locked upon the ankle of the switchman until the switch rails are again moved back to a position to open the main line, when the key of the vertical locking bar again enters the recess in the disk connected with the target rod, the spring forcing the plunger rod up, and the shackles opening to release the switchman.

NEW ARC LAMP.

The most prominent feature of all modern lamps is their vertical height, and yet where a lamp is required to burn all night this height is insufficient to permit of using carbons long enough for all-night illumination. In such lamps two pairs of carbons are used, one pair being burned until exhausted, when the other pair is automatically switched into the circuit, thus necessitating the adjustment of two carbons, and involving a serious waste in the way of carbon stubs.

The accompanying engraving shows a lamp recently invented by Mr. R. D. Carson, of Philadelphia, Pa. In this lamp a great length of carbon is contained in a small space, thereby permitting of the construction of a compact and symmetrical lamp which will burn throughout the night without the necessity of employing two pairs of carbon rods and shifting mechanism for transferring the regulator from one pair of carbons to the other.

Owing to its compact form this lamp is well adapted for indoor lighting. It has the advantage over the ordinary arc lamp in forming the arc in a horizontal plane, with nothing below the luminous point to obstruct the light. Its small size permits of making it very ornamental, and the length of its carbons renders it unnecessary to renew them oftener than once in two or three evenings, unless the lamp is used for all-night illumination. The vertical height of the lamp permits of using it in places where lamps employing ordinary straight carbons would be inadmissible.

The lamp is arranged to hold two curved carbon rods at an angle in relation to each other. Fig. 1 shows the complete lamp in operation, and Fig. 2 is an enlarged detail view of the interior of the lamp and the carbons, showing the arrangement of the regulating mechanism. The solenoid in this lamp is composed of two parts, the outer one being of coarse wire and arranged in the main circuit, the inner part being made of fine wire and connected in a shunt around the arc in the usual way. The two coils of the solenoid are connected so as to produce opposing effects upon a soft iron core.

The core carries a plate which supports a friction disk by means of springs, and a prolongation of the core carries a pinion which engages the bevel wheels on the carbon-supporting shafts. When the current is normal, the friction disk is carried upward by the movement of the core as it is drawn into the solenoid, thereby bringing the friction disk into contact with a frictional surface upon the lower end of the solenoid. This holds the carbons in a fixed position until the arc lengthens, when a greater proportion of the current goes through the fine wire of the solenoid, thus neutralizing the effect of the coarse wire coil, releasing the friction disk, and allowing the carbons to approach each other by their own gravity.

As soon as the resistance of the arc is reduced, the amount of current passing through the fine wire is diminished, when the current in the coarse wire of the solenoid draws the core up and checks the movement of the carbon rods by frictional contact of the disk against the frictional surface of the solenoid. When the carbons are in contact, the arc is formed by the upward movement of the core of the solenoid after the friction disk is in firm contact with the lower end of the solenoid.

The core is provided with spiral ribs which are capable of sliding through slots in the friction disk, so that after the latter comes to rest, the further upward movement of the core causes it to turn sufficiently to separate the carbons and form the arc.

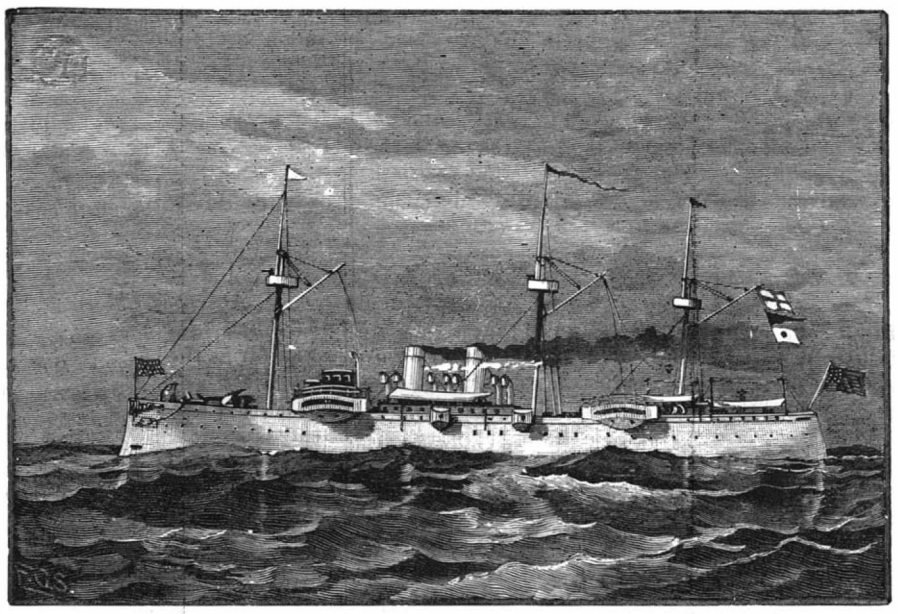
Further information regarding this compact and simple lamp may be obtained by addressing Mr. R. D. Carson, Zoological Garden, Philadelphia, Pa.

Cotton Manufacture in Brazil.

The manufacture of heavy brown cotton goods in Brazil is developing gradually and successfully, says *Industries*. Even now both Great Britain and the United States of North America are considerably injured in their sales of such goods. It is feared, when the manufacturers in Brazil have attained a little more skill and perfection in this industry, that their goods will drive all others out of the native market. And this observation applies almost equally to all other kinds of cotton products. The raw material in use in the empire is brought from Pernambuco, and costs about eleven cents per pound at the mills at Rio Grande do Sul. The retail price of one meter of brown sheeting, smoothly and evenly woven, of a weight per meter of 240 grammes, and of a width of 33 inches, is 16 cents. The price of the heavy cottons is about the same figure, but their breadth is less than that of the sheeting. The mills at Rio Grande do Sul are very prosperous. Last year they made improvements on extensive scale, and yet were able to pay the shareholders a dividend of sixteen per cent. At present the United States are very successful in supplying bleached and brown muslins and double width bleached cotton sheetings. The price of the last mentioned class of goods is about seventy cents per yard, and this limits their sales, being considered too high.

LAUNCH OF THE PHILADELPHIA.

This, the fourth of the new steel war vessels built by the Messrs. Cramp for the U. S. government, was launched from their shipyard at Philadelphia on Saturday, September 7. She was authorized to be built by the act of March 3, 1887, and the limit of cost fixed at $1,500,000, but the contract was let to the Messrs. Cramp, with special modifications from the original specifications, for $1,350,000. The law provides that she must exhibit a maximum speed of at least nineteen knots per hour. For every quarter knot in excess the contractor is to receive a premium of $50,000, and for every quarter knot of deficiency he is to suffer a deduction of $50,000. The Navy Department has prescribed a run of four hours at mean low draught for the speed test. According to the contract, the Philadelphia should be completed on October 27 next. This cannot be accomplished, but she is well advanced for a ship just



THE NEW U. S. CRUISER PHILADELPHIA.

off the ways, and the engine shafting has been put in place. The San Francisco, a sister ship now being built at the Union Iron Works, San Francisco, which should be completed one day earlier, will probably be launched about a month hence.

In the SCIENTIFIC AMERICAN of August 10 will be found an illustrated description of the Philadelphia, showing the several stages of her construction.

The Photographic Convention in London.

The photographic convention of the United Kingdom meets in London this year. An exhibition of photographic apparatus and photographs is now being held at the St. James' Hall in Piccadilly; excursions are being made daily to places of interest in or near London.

The photographic exhibition appeals as well to the general public as to the professional or amateur photographer. Upstairs in the balcony is a very fine and representative collection of "pictures"—photographic portraits of more or less pretty women, pictures of babies, interesting landscapes, historical buildings, etc., etc. Below, on the floor of the hall, are exhibited cameras, lenses, and plates, negatives of historical interest, enlarged pictures, chemicals, and the rest. As to the former, we may mention that it includes photographs by such well known artists as Friese Greene and Byrne & Co., of Richmond, as well as some interesting "platinotypes" by Keene, of Derby; among the latter is found apparatus from every well known optician and photographic chemist in London.

Being anxious to discover the objects and aims of the convention, a representative of *The Pall Mall Gazette* waited upon the president, Mr. Andrew Pringle, who was good enough to afford him a brief interview.

"This is the jubilee of photography, is it not?" asked the representative.

"Yes," replied the president. "It was just fifty years ago that the first account of Daguerre's process was published in France. Daguerre, as you may be aware, used by way of sensitized plate a plate of silver which had been exposed to the vapor of iodine. The coating of iodide of silver thus formed was acted upon by the light in much the same way as the dry plate or stripping film of the present day."

"That was the beginning of all things, then, was it?"

"By no means. Previous to that—in January of the same year—Fox Talbot's process was given to the Royal Institution and to the world by Faraday. In the same month, Talbot read a paper on 'photogenic drawing'—so he called his new process—before the Royal Society. Talbot employed the chloride of silver, which he made by dipping the medium used, first in a solution of sodium chloride, or common salt, and then in a solution of silver nitrate. We do not claim that no photograph was produced before 1839; on the contrary, we know that Wedgewood and Sir Humphry Davy produced some long before. But they could not fix the fleeting image; a few hours of bright sunlight caused it to vanish without recall. In 1819, Herschel successfully employed the sodium hyposulphite for fixing; Talbot used it in 1839, and finally tried to patent it in 1841, but failed."

"So this is why you speak of 1889 as the jubilee year of photography?"

"There is yet another reason. In 1839 Mungo Ponton discovered the action of certain chromates upon gelatine. That gave rise to numerous processes, and is also the basis of an immense number of the photo-mechanical printing processes now in vogue. The first undoubted record of the use of a gelatine emulsion is that of Harrison, in 1868. He did not persevere in his labors, however, but left them to be taken up by Dr. Maddox in 1873. Maddox perfected the gelatine bromide process, which, with certain alterations and improvements, has been in use ever since."

"One may take it, I suppose, that great advances have been made since the tentative efforts of Daguerre and Fox Talbot fifty years ago?"

"Yes; but the advances have been made not so much in the direction of results—though these, of course, are remarkable — as toward the convenience and rapidity with which these results are obtained."

"What about the future?"

"Well, our great aim at present is to devise some method by which photography may be able to render in monotone the visual brightness of certain colors of the solar spectrum. For example, the deeper blues—indigo, violet, etc.—are largely used by painters to represent the darker shades of a picture. These colors, however, constitute the actinic rays of the solar spectrum; they have a more powerful action than any other upon the ordinary sensitized plate; consequently, they come out in the photograph pretty much as if they had been white. We want photography to be orthochromatic, or color correct; and I may tell you that our aim is so far within our reach that plates have been prepared which prove to be more sensitive to the yellow rays than the blue."

American Association for the Advancement of Science.

At the session of this association recently closed at Toronto, Canada, the following officers for the ensuing year were unanimously elected: President—George L. Goodall, Cambridge, Mass.; Vice-Presidents—S. C. Chandler, Cambridge, Mass., mathematics and astronomy; Cleveland Abbe, of Washington, physics; R. B. Warder, Washington, chemistry; James E. Denton, Hoboken, N. J., mathematical science and engineering; John S. Brauner, Little Rock, Ark., geology and geography; C. S. Minot, Boston, biology; Frank Baker, Washington, anthropology; J. R. Dodge, Washington, economic science and statistics; Permanent Secretary—F. W. Putnam, Cambridge, Mass.; General Secretary—H. C. Bolton, New York; Secretary of Council—James Landon, Toronto; Treasurer—William Tilly, Mauch Chunk, Pa.

The association will meet next year at Indianapolis, on the third Wednesday in August.

THE Pittsburg *Commercial Gazette* says: Few persons are aware that an aluminum-making plant is now in full operation in this city. This industry was established here during the winter by the Pittsburg Testing Laboratory Company, and has proved a decided success. The product is obtained by a process of which electricity is a great factor.

About fifty pounds of aluminum metal are produced daily. It is worth about $4 per pound, and this is a very large single output when compared with the product of the factories in other parts of the world. The material is used for various purposes. It has taken the place of silver leaf in sign painting, and in that particular has proved a great success.

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THE HARLEM RIVER AQUEDUCT TUNNEL AND ITS APPROACHES.

When the subject of crossing the Harlem River by the proposed new aqueduct was considered, various means were discussed, one of them that of a viaduct, similar to High Bridge, and while it was believed that of the two methods the viaduct was thought to be the most costly, it was not so much on the score of economy as on that of safety that the method of a siphon tunnel was preferred.

Our first cut shows a longitudinal section of the tunnel and the shafts which were the base of operations during the long months of construction. The sections shown seem to be two in number, the upper one in coming to a stop at crevice in the river bottom, and the lower one running entirely across. Before the upper section was started, soundings were taken in the river bottom, and the indications of a firm bottom seemed conclusive. After the tunnel had been driven quite a distance, the roof appeared wet and heavy, and water seams became more and more troublesome. Prior to this the drill had been run down, with courses crossing from both sides of the river, so as to determine, if possible, the feasibility of going ahead. The indications from the drill were more encouraging than the work directly in hand; but it was thought best to persevere, as the enormous expense of sinking the shafts deeper was fully realized. So the upper tunnel was pushed ahead from the south side until the water came in such quantities, not from a crevice, as our artist has with some license suggested, but from innumerable small openings in all directions, that finally became too great to be successfully resisted. A strong bulkhead was then built in the upper tunnel, and the shaft known as No. 25 was sunk to a depth of 307 feet below mean high water. At the point indicated in the cut it had reached a depth of 157 feet. It was, therefore, finally put down 150 feet deeper. The distance from center of shaft 24 to that of 25 is 1,312 feet, and the internal diameter of the tunnel, which was circular in section, was 10 feet 6 inches, with an area of 86·59 square feet. This shaft is the deepest one on the new aqueduct, and altogether its depth amounts to 419 7/10 feet. The pressure of the water on this part of the tunnel is enormous, and the circular form is chosen because of its greater resistance. We have been informed that a steel shell made of riveted segments will be built as a lining to the brickwork, to add material resistance to this pressure. For some time experiments have been making, looking to the discovery of a substance with which all the circular sections of the new aqueduct may be lined, so as to diminish the great loss of water due to the perviousness of brickwork. It has been found, after repeated tests of many alleged superior washes, paints, gums, etc., that a thin coating of neat Portland cement of good grade, so thin as to be put on with a brush, is the most effective. We understand that these experiments are still going forward, and that no final report with recommendations has yet been made.

When shaft 25 is completed, it will be of a twofold character. It will be divided by a brick wall into two separated shaft chambers, one the aqueduct shaft and the other the pump shaft. In the latter will be constructed two inverted arches, the first one about 47 feet below the roadway, and the second one 16 feet lower.

Our second cut shows the operation of building a pair of inverted arches. The object of the lowest one is to resist any sudden upward pressure of water that may arise, and the upper is to re-enforce the lower one.

Passing from shaft 25 to 24, a point of striking interest is shown in our sketch, figured 3 and 4. Looking at Fig. 1 again, on the right hand, a jog or offset is shown in the vertical continuance of the shaft. Horizontally, it becomes a turn in the course, and it was done, we believe, in the hope of getting better ground to work in. This hope proved delusive, and it is now believed that it would have been better to have gone further north and sunk the shaft directly down, as an offset in a shaft of this character interferes with pumping or lifting. In the opening to the left the entrance to the lower shaft is seen. This jog in the course of the shaft is due, not to the reason assigned above, but to bad engineering. The alignment of the siphon tunnel deviated so much from its proper direct course as to make the turn horizontally necessary, as the siphon leg was progressed from the south northward entirely beneath the river to what was supposed to be its intersection in a vertical plane. Having ascertained the true position of the tunnel below, shaft 24 was turned and then driven down to meet it. This turn in the shaft necessitated two lifts to remove the excavated material, and also imposed the burden of emptying the siphon upon shaft 25.

In the fifth sketch is a view of the pump and aqueduct shafts, with four-foot blow-off pipe connections with a gate house. The blow-off pipes, which primarily are the outlets when the tunnel is to be emptied, also add to the safety of the shaft by providing means of relieving it of an excess of pressure should such ever occur.

The pump shaft is provided for the purpose of emptying the section of the tunnel between shafts 24 and 25 whenever a necessity for so doing may occur. To this end great cylindrical iron buckets have been constructed, capable of lifting 1,350 gallons at once. They are shown in our sketch. The advantage of these huge buckets over pumps is as follows: The siphon will be emptied and cleansed out not oftener probably than once in nine months or a year, and this operation will occupy but a small interval of time. They are operated either by windlass or by a pony engine winding a cable about a drum. Attached to the cable, they are ready for instant action. Pump action is found serviceable only where there is some degree of constancy; irregular work promotes rusting of parts and damage to the operating machinery. The buckets are of the simplest construction, being made of boiler iron sheets of a cylindrical form and bolted together at the joints.

The reason assigned for sinking the shafts to such a great depth was that the bad character of the material made it necessary. This would be a sufficient answer if it were not true that much more difficult ground had been successfully tunneled by means of the freezing process. Why this process was not tried has not been successfully explained, the plan followed having added greatly to the expense of the whole undertaking and constituting one more addition to the sum of bad engineering.

The special provisions pertaining to the execution of the work are of the most approved character. All brick masonry shall be laid to a line, with the beds in the line of the radii of the curves and with joints not exceeding ¼ inch for either face or arch work. The inside faces of the joints shall have all the joints cleaned off, pointed, and left in a neat condition. The mortar and cement requirements are fully up to the standards established in this great work. In regard to the tunnel lining, the provisions of the contract call for cast iron rings 2½ feet long, measured along the axis of the tunnel. The rings will be composed of ten pieces, put together by bolted flanges. The joints will be made with strips of lead, three inches wide and one-quarter of an inch more or less in thickness. The open horizontal joints on the interior face are to be filled with rust joints. All pieces to form rings are to be so formed as to be interchangeable. The joints between rings will be hub and spigot joints.

Shaft 25 was begun March 21, 1886, and sunk to a depth of 385 feet below river level, or the point at which the siphon tunnel started northward, July 1, 1887, or one year and four months. The siphon tunnel began August 1, 1887, and progressed as far as the vertical alignment of shaft 24, a distance of 1,312 feet, February 9, 1889, or about one year and six months. These figures do not give any basis for calculation as to the rapidity of excavation. Shaft 25 was begun March 1, 1886, and 261 feet had been excavated up to October 30, 1886. Time occupied 7 months and 29 days. Subsequent progress was delayed for reasons other than that of necessity, and are not to be considered in such an estimate.

The work under the Harlem and its approaches is no doubt the most difficult work undertaken on the new aqueduct, and from an engineering point of view perhaps the most unsatisfactory, either in its installation or economical execution.

Classification of Patents of Thomas A. Edison.

TELEGRAPHY.—Printing and automatic, 52; chemical and perforating, 34; perforating machines, 6; chemical stock printer, 1; multiplex, 17; relays, 8; switches, 2; phonoplex, 3; induction relay tel., 2; acoustic, 2; amr. and ind. signal app., 4.

ELECTRIC LIGHTS.—Incandescent lamps and manfr., 104; arc lamps, 4.

DISTRIBUTION.—Systems of regulation and indicating devices, meters, sockets, switches, 66.

GENERATION.—Dynamos, motors, 3; transmission of power, 54; regulation, 50.

RAILWAYS.—Electric motor and tracks, 8.

CONDUCTORS, UNDERGROUND AND OVERHEAD, 3.

TELEPHONES.—Transmitters and receivers, 32.

BATTERIES, GALVANIC AND SECONDARY, 3.

PHONOGRAPH, 21.

ORE MILLING, 4.

MISCELLANEOUS.—Electric pen and stencil app., 66; typewriter, 3; shafting, 1; malleabling iron, 1; vocal engine, 1; preserving fruit, 1. Total, 493.

Besides these he has over 300 applications for patents pending on all subjects.

The various interests bearing his name own many hundred other patents covering details and modifications of Mr. Edison's inventions.—*W. J. Hammer, Electric World.*

INCOMBUSTIBLE TEXTILES.—There are many substances which have the property of rendering the fabrics to which they are applied incombustible, but they usually spoil them, either by changing the color or stiffening them to such a degree that they cannot be used. An easy and safe way of protecting curtains and mosquito nets against fire is said to be by steeping them in a solution of phosphate of ammonia, obtained by mixing ½ a liter of water (1 pint) with 100 grammes (about 3 ounces) of phosphate. In this way the color and texture remain unaltered.

Correspondence.

Astigmatic Eyepiece for Optical Instruments—A Correction.

To the Editor of the Scientific American:

Your issue of August 31 contained a reference to myself which is so preposterous that to the initiated it contains its own refutation. Nevertheless, to prevent possible misconception on the part of those who do not know me, I beg to be permitted to express my exceeding regret and annoyance at my name being used in your columns, as it certainly was, without my permission or knowledge. J. A. LIPPINCOTT.

To the Editor of the Scientific American:

The article in the SCIENTIFIC AMERICAN of August 31, 1889, on "Astigmatic Eyepieces for Optical Instruments," should have read 28,000 prescriptions from Dr. Lippincott *and others.* J. KORNBLUM.

Pittsburg, September 1, 1889.

Sugar as a Remedy for Boiler Incrustations.

To the Editor of the Scientific American:

It is now nearly three years since you brought to notice the experiment of an Italian engineer, employing sugar to prevent boiler incrustations. I tried it immediately afterward, with the success claimed, and have employed it ever since. Our feed water coming from a well, being excessively bad, we had great trouble to get rid of the scales. The boiler was very old, about thirty years, and we intended to buy a new one. So I thought, if any harm should come out of the sugar, there would be not much lost. With the sugar, of which I employed three pounds of the brown kind, and a handful of wash soda, in four weeks, we found a heap of sandy mud on the second sheet or above the grate, the flues being covered with scales as usual, but the scales were soft and easily removed The same thing happened with new tubular steel boiler. We find most of the solid matter above the grate, and the tubes and boiler sheets covered with a thin adhering film of scales as high as the water reaches. Above the communication with the mud drum the tubes are thickly covered with soft scales after heavy rains, but under the scales the metal is as sound as when new. * * * A. BONENBLUST.

Tell City, Ind., August 13, 1889.

PHOTOGRAPHIC NOTES.

The Pyrocatechine Developer.—Dr. Carl Irna gives the following formula:

Solution A.

Sulphite of soda	100 grammes.
Hot distilled water	400 c. c.

Solution B.

Carbonate of soda	100 grammes.
Water	400 c. c.

Take 30 c. c. of A, 60 of B, and add one gramme of pyrocatechine.—*Revue Photographique.*

Prevention of Blisters in Albumen Prints. — Dr. Vogel recommends the use of a bath of alcohol, after toning and before fixing, as a remedy in obstinate cases of blistering. He advises alcohol at 70°. With our ordinary methylated spirit we should get at something near enough to this strength, by adding one part of water to four parts of the spirit at the strength at which, on the average, it is sold. An immersion of the prints for three minutes in this liquid before fixing will generally suffice to prevent blistering in cases when other means fail. Of course, if the spirit is used for more than one batch of prints, the water taken in with the photographs must be taken into account when reckoning the strength of the solution; and when any large number of pictures are to be immersed in a limited quantity of the diluted alcohol, it will be desirable for the prints to have the excess of water removed by lightly pressing a pile of them first. The alcohol itself then may be somewhat stronger to begin with.—*Photo. Review.*

Ink for Writing on Photographs.—The following answers very well for numbering and marking proofs, the writing being executed on a dark portion:

Iodide of potassium	10 parts.
Water	30 "
Iodine	1 "
Gum	1 "

The lines soon bleach under the strokes by the conversion of the silver into iodide.

Natural Gas for Balloons.

Prof. Carl Myers, who lately made a balloon ascension from Sandy Creek, N. Y., had the balloon inflated with natural gas from the gas well there. Nearly 1,000 people witnessed the ascension. Prof. Myers had been invited to Sandy Creek by the directors of the gas well for the purpose of testing the supply of the well. The experiment proved eminently satisfactory. The capacity of the balloon was 11,500 ft., and it took just thirty minutes to fill it, which would show an average flow of over 500,000 ft. per day. According to the present showing the well is a very valuable one, and the prospects are very flattering for a much larger flow as the drilling continues.

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WITH MR. EDISON ON THE EIFFEL TOWER.

R. H. Sherard, representing the *Pall Mall Budget* (London), relates as follows his interview with Mr. Edison in Paris :

This is what Edison wrote to me, says Mr. Sherard, when I proposed he should grant me five minutes talk with him :

"All right. Friday about eleven in morning. I'll be sane by that time. My intellect is now making 275 revolutions a minute."

I called at the Hotel du Rhin at eleven o'clock, and was shown up to the handsome drawing room on the first floor. Edison was standing by the mantelpiece. At a secretaire by the window were Colonel Gouraud, Mr. Durer, and others ; at the far end the sweet girl wife Mrs. Edison, surrounded by various persons. It is always difficult to begin, for one who has come to annoy, but I plunged into matters at once.

THE ORE-EXTRACTING AND THE FAR-SEEING MACHINES.

"About this ore-extracting machine," Edison said, "it's going to be a great thing. Already we have eighty machines at work in the iron mines. Yes, it is adapted for iron ore only as yet. I am studying the question of a machine for treating both refractory silver ore and gold ore, and shall get them out by and by. Then we shall make more money."

"The far-seeing machine ?"—" I have heard," he said, "that some European inventors claim to have preceded me in this, but I do not know anything about their inventions. My machine is getting on very nicely. I do not think it will ever be useful for very long distances, and it is absurd to say that it will enable one to see another ten thousand miles away. In a city, however, it will be of practical use. I don't look for anything further, at least at present."

THE PHONOGRAPH AND THE PRESS.

"The phonograph ?"—" We have got it into practical form. Already 1,800 machines are in use in commercial houses, and our factories are now turning out forty machines per diem. I have also, at last, been able to make a perfectly solid mailable cylinder, which can go through the post for any distance without risk of damage. All this has been very hard work. On the tools for making the big phonograph alone we spent $5,000. I have also created a small model—a pocket phonograph, if you like to call it so—the cylinder of which will take 300 words, the length of an ordinary letter, and which will be very practicable for ordinary correspondence. I have the model here, and you can see it any day you like. These are not, however, yet ready for sale."

" What use can newspaper people make of it ?"—"Oh, plenty. It is already used in the *World* office. The machine is placed downstairs. The reporters come in and talk into it. The cylinder is taken upstairs to the composing room, and the compositors set up from its dictation. They attain much greater speed, make more ems in an hour than on the old system, and earn more money."

IMPRESSIONS OF PARIS—"WHEN DO THEY WORK?"

"How are you impressed with Paris ?"—" Oh, I am dazed. My head's all in a muddle, and I reckon it will take me at least a year to recover my senses. I wish now that I had come over in my laboratory blouse, and could have gone about unknown and have seen something. The exhibition is immense, larger than our Philadelphia exhibition. So far, however, I have seen but very little of it. This morning, however, I saw a tool which will save me $6,000, clear, a year. It is a chisel worked by hydraulic pressure. I just saw it, passing by—just a glance. I shall order some, and send them out. They will enable us to reduce our labor by eighteen hands." "That's a good morning's business," said Colonel Gouraud. "Yes," said Edison, and continued: "What has struck me so far chiefly is the absolute laziness of everybody over here. When do these people work ? What do they work at ? I have not seen a cartload of goods since I came to Paris. People here seem to have established an elaborate system of loafing. Some of these engineers who come to see me, fashionably dressed, walking stick in hand—when do they work ? I don't understand it at all."

EDISON'S RELIGION OF WORK.

"Over here we hear wonderful stories of your working. You have the reputation of being able to work twenty-three hours a day for an indefinite period."—"Oh ! I have often done more than that, haven't I, Gouraud ? As a rule, though, I get through twenty hours a day. I find four hours sleep quite sufficient for all purposes."

Edison pronounces the words "work" and "working" as some do " prayer," " religion." It is also a religion, it is true.

" I see you smoke. It does not harm you ?"—" Not at all. I smoke about twenty cigars a day, and the more I work, the more I smoke." Some one remarked, " Mr. Edison has an iron constitution, and does just everything contrary to the rules of health. Yet he is never ill."

UP THE EIFFEL TOWER WITH EDISON.

I asked : " Beyond the far-seeing machine and the rest,are there projects ?"—" Any number," said Edison. " When we make our big exhibition in America, I shall have to have several new things." It is perfectly useless to ask Edison for information as to ideas. In him everything is so practical that it seems he cannot talk about what is phantom merely. It is the " what is " with him, and not the " about to be."

Mrs. Edison then asked the Cavalier to do her the pleasure of lunching with her, *chez* Brebant, on the Eiffel tower. Colonel Gouraud asked me to be of the party, and together we went on to order breakfast. *En route* the Colonel asked me to contradict a story which has appeared that he brought to Edison a phonographic message from the Queen. " Mr. Edison received messages from the Queen of Italy, from the King, and from the Prince of Naples. I suppose that is what the story was based upon."

PREPARING TO OUTTOP THE TOWER.

" When on board the ship," said Edison, as we sat down to *dejeuner* on the terrace of the Eiffel tower, *premiere etage*, " they put rolls and coffee on the table for breakfast. I thought that that was a very poor breakfast for a man to do any work upon. But I suppose one gets used to it. I would like one American meal for a change—plenty of pie for a change." He then smashed the roll with his fist.

There were six of us—Mr. and Mrs. Edison, Colonel Gouraud, the Cavalier, and Mr. Durer, the author of a very remarkable brochure on Edison. And we had the world at our feet. There were shrimps among the *hors d'œuvre*. Edison had never seen any. " Do they grow larger ?" he asked, and added, " They give a great deal of trouble for small results."

" This Eiffel tower ?" I said.—" The work of a bridge builder," said one. " No," said Edison decisively. " No. It is a great idea. The glory of Eiffel is in the magnitude of the conception and the nerve in the execution. That admitted, and the money found, the rest is, if you like, mere bridge building. I like the French," he added. " They have big conceptions. The English ought to take a leaf out of their books. What Englishman would have had this idea ? What Englishman could have conceived the statue of Liberty ?"

" Will you beat the tower in New York ?"—" We'll build one of 2,000 feet. We'll go .Eiffel 100 per cent better, without discount."

IS A THOUGHT-RECORDING MACHINE POSSIBLE ?

" Could not," I asked, " a machine be made which could be adapted to the head, and which would record one's thoughts, saving the trouble of speaking or writing ?" Edison reflected. " Such a machine is possible," he said ; " but just think if it were invented. Every man would flee his neighbor, fly for his life to any shelter."

As they brought in the *filets a la Brebant*, I said, and thought of little Dombey, " What is electricity after all ?" He said, " It is a mode of motion, a system of vibrations. A certain speed of vibration produces heat ; a lower speed, light ; still lower, something else."

THE REIGN OF HUMBUG.

" Is there anything in electricity as applied to medicine ?"—" There is a great deal of humbug in all that," he said. Then as a careful *maitre d'hotel* brought in the cradled *Clos Vougeot*, and served it with exaggeration of anxious ceremony, he added, " There is a great deal of humbug about wine too. And about cigars. Men go by cost. The connoisseurs are few. At home, for fun, I keep a lot of wretched cigars, made up on purpose in elegant wrappers, some with hairs in them, some with cotton wool. I give these to the critical smokers, tell them they cost 35 cents apiece. You should hear them praise them."

THE EDISON "SANATORIUM."

We talked of cooking and of famous *chefs*. Also of one who recently engaged a French cook at a bishop's salary. " Bright's disease of the kidneys is all the dividend that man will draw," said Edison. He seems to take delight in commercial phrases. It is comfortable to hear him pronounce the words " make money." Commerciality with him is dignified and impressive, vulgar as it is with others. The breakfast was *recherche* in the extreme, but Edison barely touched anything. " A pound of food a day is all I need when I am working, and now I am not working." One could not help thinking of Chatterton and his crust.

After dessert there was champagne, and toasts were drunk. The Cavalier began. Edison said : " The Cavalier is profuse, but not so much so as another Italian gentleman who once proposed my health, and remarked that even the chickens in his country knew my name.—It's a regular sanatorium," he remarked later on, " so much ' health ' being distributed." Again, " All this is new to me," alluding to the ceremonial of our festivities. " If I stay long here I shall too soon be able to get up and make speeches and wave my arms." When the coffee and cigars came in his face brightened up. " Mr. Edison is beginning to breakfast," said the Colonel. ' Yes," said Edison, taking an Havana ; " my breakfast begins with this."

THE MAN AND THE MONUMENT.

A few minutes later, happening to pass the tower, I saw at its foot again the man, with his face boyish almost for its openness, and the gray hairs over the unwrinkled forehead. Then I looked at the monument first and then at the man. The monument thus contrasted appeared infinitesimally small.

The Deadly Alternating Current.

The East River Electric Lighting Company, at its dynamo house, East 24th St., this city, employs the Thomson-Houston system of electric lighting, using in all its outside lamps the direct current. But in the dynamo room is one machine which generates the alternating current, and this is used to supply the incandescent lights in the building, and, recently, for experiments by the Perry Motor Company. This one machine generates 1,000 volts power, and has not been long in the building.

On September 2, says the *N. Y. Times*, something went wrong with the switchboard connected with this machine, and Darwin A. Henry, the superintendent of construction of the company, undertook to set it right. He climbed up on the short ladder used to reach the switchboard, and started in on his work. He had been thus engaged for about five minutes when he attempted to turn part way around on the ladder. In some way one of his feet slipped, and for an instant he was in danger of losing his balance. Instinctively his arms were thrown up to recover himself. One hand came in contact with the negative terminal on the board, and hardly had he touched it when the other had struck the positive pole. The effect was instantaneous. The unfortunate man's hands remained as if glued to the death-dealing wire, his head dropped over on one shoulder, and in that position he remained for some moments. He did not utter a sound. There were two other men, named Thomason and Smith, working in the room, and one of them after a few seconds caught sight of his chief resting apparently with all his weight against the switchboard. Both men rushed to his assistance, but the man was dead. They tore his hands from the wires and lifted his body down and laid it on a bench. One of his hands—the right one—was terribly burned, the flesh having been consumed to the bone. The other hand was burned, but not so very badly.

Medical help was at once summoned. Dr. L. D. Henderson and Dr. W. C. Feeley were at the superintendent's side within ten minutes, and worked hard in trying to restore animation, but they might as well have tried to put life in a stone. They injected, hypodermically, quantities of brandy. Sylvester's system of artificial respiration was called into use, and they tried with a galvanic battery to bring the man back from death. But all efforts were absolutely useless, and after two hours of hard work the weary physicians were obliged to abandon their task and declare their patient dead.

There had not been a single evidence of life in Henry from the time he touched the wires. When the doctors reached him, the heart had ceased to beat and there was no sign of respiration.

In the opinion of both physicians, Henry's death was instantaneous, and, if the absence of any contortion either in body or face proved anything, it was a painless one. The burns in the hand, both the physicians and the employes in the building believe, were caused when the hands were torn away from the wires and after the man was dead. The separation created an arc, and without an arc there can be no burns.

Mr. Henry was about thirty years old, unmarried, and had been a practical electrical engineer from his boyhood. He was a capable electrician, and had much experience in handling electric apparatus, and was highly regarded by his employers.

The final argument on the question of the constitutionality of the new electric execution law, a question which involves the disputed power of an alternating current to kill, will be held at Buffalo within a fortnight, and this case may have considerable weight in the argument. It is proposed to use an alternating current of from 1,500 to 2,000 voltage in these executions, and it is contended that that force would not be sufficient to kill. In this case a 1,000 volt current, even when only accidentally applied, did its awful work effectually.

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AN ATTRACTIVE CHEAP DWELLING HOUSE.

Illustrated herewith is a commodious dwelling house erected on Armory Hill, Springfield, Mass., and at a cost of $3,600. Width, 31′ 6″; depth, 44′ 6″, not including piazza. Height of first story, 9′; second story, 8′ 6″; contains all the latest improvements and conveniences. There is a cellar under whole of house, containing a furnace and laundry; all furnished in the best manner. The exterior is covered with beveled white pine clapboarding, gables filled with shingles; slate roof. The hall is furnished with an ornamental staircase, with newels, posts, balusters, and rail, all handsomely turned of ash. The landing on staircase contains a pretty window glazed with stained glass. The door and window casings are neatly beaded, and turned sunk angle blocks are provided at angles. The trim is of ash. Open fireplaces provided with hearth and facings of rich tiles and handsome hard wood mantels. Five bedrooms on second floor, and bathroom. Large closets well fitted up with drawers and shelves. From front bedroom, door to veranda. The bathroom is fitted and finished in the best manner. The engraving was prepared from a photograph of the building taken specially for the ARCHITECTS AND BUILDERS EDITION of the SCIENTIFIC AMERICAN, and appeared in the August, 1889, number of that publication, together with the plan views of the first and second floors. The same number also contains engravings of several other attractive dwelling houses, costing from one thousand dollars to eight thousand dollars and upward.

AN ATTRACTIVE CHEAP DWELLING HOUSE.

Life Insurance.

Under the heading "Seven Things Hard to Explain," the *Insurance World* copies from *The Metropolitan* the following seven queries, which are calculated to set heads of families to thinking.

1. Why some men who are willing to toil and strive and save, that their families may be comfortable while they are alive, are not willing to pay a few dollars a year that their families may be kept from want after they are dead. 2. Why some men who are so prudent that they will not trust the welfare of their loved ones to the strongest life insurance company in the land, are, nevertheless, willing to trust it to the most uncertain of human chances—the contingency of their living long enough and being fortunate enough to earn and save a competency. 3. Why, on the other hand, some men who are so unsuspicious that they will trust an acquaintance who has not a dollar in the world to almost any extent, will, nevertheless, hesitate to trust a life insurance company that guarantees its promises with millions of assets. 4. Why some men who could not rest a moment if their houses and stores and factories were not insured, never think of the importance of insuring their lives, by whose productive power those houses and stores and factories were acquired. 5. Why the man who refuses to insure his life because he can take better care of his money than the insurance company can, generally proves to be the man who is not able to take care of it at all. 6. Why some men, who say that their whole lives are devoted to laying up a competency for their families when they are gone, never seem to think of the simplest and quickest method of accomplishing that object—taking out a policy on their lives and paying a weekly premium. 7. Why it is generally necessary to carry the blessings of life insurance to a man's house and thrust them upon him, while he is frequently ready, unsolicited, to spend his money for things that are not blessings at all.

Mexican Mahogany.

The other day *The Timberman* visited Mr. Fred. Schindler, who has recently returned from Mexico, and learned something about the fine mahogany logs which that gentleman secured for the firm of J. Rayner during his sojourn in the sunny southern climes. Mr. Schindler is a close observer, and his comments on the manners and customs of a race we know little about are interesting in the extreme. On his first visit to Mexico he was greatly surprised to find how little was known about it in the United States. The portion visited by him has been invaded by very few foreigners, and is about two hundred years behind the times. But northern capital and energy is gradually stretching out in that direction and finding an ample field. Strangers are still looked upon with distrust, and are not admitted to domestic relations with the natives. The agricultural possibilities are almost unbounded. Anything can be raised except the northern fruits, and so prolific is the soil that three crops of corn are frequently harvested a year. The climate is very unhealthy, and sickness prevails in all localities.

Mahogany in Mexico is becoming very scarce, and one is now obliged to go two or three hundred miles from the coast to secure first-class stock. The logs are cut during the summer months, hewn square, and then lie in the woods to await the fall freshets. These begin about the first of October, and the rivers, which have been dry for months, become rushing torrents. The logs are then thrown in and tumbled down the mountain sides until they reach more level country, where they are collected into rafts and continue their journey to the gulf. Here they are loaded into ships and thus reach the American market.

As to the size of the logs there is, to use Mr. Schindler's words, "practically no limit," some cut by him being 100 feet long, and will square four feet at the top. Of course, such logs as these are too unwieldy for transportation, and are therefore cut into fourteen or sixteen foot lengths. The export duty on logs is $2 a ton, and this is charged on the tonnage of the ship. If there is any deck load, it must be paid for extra, at the same rate. And for every dollar of duty paid there must be affixed to the certificate a two cent revenue stamp.

Mr. Schindler has secured some very fine logs, which are now on their way to this market. Upon their arrival he promises to show some of the finest mahogany ever brought into this city.

The scarcity of mahogany at the old points of supply is leading to research into new fields. Some stock is now being cut in South America, but the quality is not up to the Mexican. It is probable, however, that as the hunt is carried further into the vast and hardly explored forests of this country, better results will follow.

Aluminum.

At a recent meeting of the Academy of Sciences, San Francisco, F. Gutzkow delivered an address upon the subject of the manufacture of aluminum. He claimed that no real progress had been made with this metal, and that the only chemical achievement of recent years was to reduce the heat which permits the use of cast iron. It is a comparatively unknown metal of great lightness, being one-fourth the weight of silver and one-third of that of iron. Its lightness makes it especially desirable in the construction of mathematical instruments.

It is very malleable, and is of a clay color. Sulphuric, nitric, and like acids have no effect upon it, but it makes no resistance to hydrochloric acid or to alkalies. In its alloys the best is made with copper, the color being gold. It is used largely in making watch cases and chains. As it does not corrode, it can be used in cooking, but its dirty appearance, together with its liability to become perforated by soaps, which eat it very rapidly, renders it quite undesirable. Its manufacture out of clay the speaker ridiculed as an impossibility, and he claimed further that there had never been an authenticated case of such manufacture. —*Pac. Lumberman.*

Continental Wages.

A stay-at-home man can have only a very vague idea of the position of England as compared with foreign countries. Especially he can have little idea how much leveling up has to be done with the wages of most Continental workers. If we say that from a half to one-third of our wages is the rate over vast regions of the Continent, we should not be far wrong. They are excessively low in some districts of southern Italy, as on the plains below Vesuvius, where five shillings a week for a man is not uncommon, and the agricultural laborer of Bohemia is not much better off. The normal condition, almost everywhere, is so far below ours that it constitutes a danger to us and a cause for the migration of trades, which are always seeking the easiest and most profitable lines.

A traveler who during the last three years has traveled over 30,000 miles of various European countries, declares that he has not once seen wages equal to those at Nottingham.—*Manchester Textile Mercury.*

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The Meeting of the American Geological Society at Toronto, Wednesday and Thursday, August 28 and 29, 1889.

A movement for the formation of an association to include all the geologists of North America has been on foot some years, but actual organization was not effected until last December, and the first meeting at which papers have been read has just been held at Toronto, Ontario, in connection with the thirty-eighth annual meeting of the American Association for the Advancement of Science. The formation of the American Geological Society was first seriously suggested at the Cincinnati meeting of the A. A. A. S. in 1881, with the result that a committee, consisting of J. Proctor, of Kentucky, C. H. Hitchcock, of New Hampshire, H. S. Williams, of New York, N. H. Winchell, of Minnesota, and S. A. Miller, of Ohio, was appointed to get suggestions as to the new society. The circular which this committee issued received wide and cordial response. At Montreal the following year the committee reported results, and another committee, of which N. H. Winchell was chairman and C. H. Hitchcock secretary, was appointed to draught a constitution.

Several of the older and more conservative members of the A. A. A. S., however, at that time were opposed to the formation of a geological society, thinking that it would operate disastrously to the association at large, so that the only thing that was accomplished at Montreal, besides the drawing up of a provisional constitution which was not really adopted, was a resolution recommending the establishment of a geological journal. Soon afterward the *American Geologist* was established to supply the demand thus expressed.

For several years nothing further was done toward organization, though the matter was kept alive by correspondence; but after the *Geologist* had become fairly established, a renewed appeal was published in that journal by the Montreal committee that all persons interested in the formation of a geological society should meet at Cleveland, in 1888, in connection with section E of the A. A. A. S. This time the movement was destined to be a success, for most of the prominent geologists of the country who had formerly opposed such a society or had been indifferent to it were now urgent advocates of it. This decided change was brought about by complications which had arisen in connection with the International Geological Congress and the American committee thereof, partly on account of the cumbersome machinery of the great American Association for the Advancement of Science. From the Cleveland meeting of the A. A. A. S., therefore, dates the actual existence of the American Geological Society. The meeting at Ithaca last December was merely to complete the organization, and has received due notice in the columns of the SCIENTIFIC AMERICAN.

Last week, Wednesday morning, after the geological section of the A. A. A. S. had completed its organization for the Toronto meeting, it adjourned temporarily and Prof. Alexander Winchell, of the University of Michigan, called the Geological Society to order and gave a very encouraging report of progress. The 112 "original fellows" have received additions, until now the society has 175 members, and a good working surplus in the treasury, and includes within its ranks all the noted living geologists in the United States and Canada, with one exception. When Prof. C. A. White, vice-president of section E, had concluded his interesting and valuable paper on the Mesozoic rocks of North America in the afternoon, a provisional constitution was laid before the Geological Society. One of the main features of this was the provisions for membership. Members are of four classes: Original fellows, fellows geologists resident in North America, corresponding members geologists residing outside of North America, who have rendered special service to the science, and patrons, those who have done some great favor to the society. The matters of voting by proxy and publication aroused some discussion, but were referred back, together with the remainder of the constitution, to the committee to be laid before the society again at the annual meeting in the winter with whatever suggestions might be offered by fellows in the meantime.

Thursday was the day for papers, and section E had adjourned out of respect to the society; indeed, this step was almost necessary, for most of the members of the former belong also to the latter. Many of the most noted geologists on the continent had gathered together when the meeting of the society was called to order in the theater of the Normal School; among them were the world renowned Prof. James D. Dana; the equally celebrated paleontologist, Prof. James Hall, the president of the society; the great paleobotanist Sir J. W. Dawson; Dr. A. R. C. Selwyn, director of the Canadian survey; Prof. G. K. Gilbert, assistant director of the U. S. Geological Survey; Prof. T. C. Chamberlin, president of the University of Wisconsin. Between forty and fifty fellows were in attendance, all of them earnest workers in some department of their great science.

President Hall's opening address was an interesting statement of the origin and history of geological societies and associations in America. The first society for furthering geological science was formed in 1824 by a few enthusiastic students, but it was short-lived. In 1840 the scientists engaged in the State geological surveys throughout the United States united themselves into the American Geological Association, with the especial object of devising a suitable nomenclature for the formations of this country. After a few years this society was united with a society which had been formed by the naturalists, and the new body took the name of the American Association of Geologists and Naturalists. The physicists and chemists soon joined this society, and the present great Association for the Advancement of Science was the result. Out of this association again has sprung the new Geological Society.

After Professor Hall had concluded his address, Professor Dana gave an elaborate paper on "Areas of continental progress in North America, and the influence of those areas on the work carried on in them." In the first part of his communication the author described the three great Archæan and Paleozoic depressions or valleys of the Atlantic; the inland sea of central New York and eastern Ohio, which in later Paleozoic times was partly shut off by the island of the Cincinnati uplift from the remainder of the great continental ocean; and the great regions of the Rocky Mountains and the far West. On account of the great development of Silurian rocks near Lake Ontario and the perfection of their fossil remains, he suggested that the term Ontarian be substituted for Silurian in local phraseology. Especial interest attaches to this paper because in it Professor Dana practically reviews his own "Manual of Geology," bringing out his conclusions from recent observations all over the world, and showing wherein important statements and theories given in the manual must be modified. Professor Dana has attended none of the meetings of the A. A. A. S. for several years, and his presence at this meeting and active participation in the session of the Geological Society were a great encouragement to the new society.

The next two papers were by Professor Hall, and were entitled "Some suggestions regarding the subdivision and grouping of the species usually included under the generic term Orthis, in accordance with external and internal characters and microscopic shell structure," and "On new genera and species of the family Dictyospongidæ." Professor Hall contented himself with giving a mere sketch of an elaborate memoir which he has prepared on these subjects. The figures illustrating the morphology of different species now included under Orthis, and those showing the recent and great enlargement of the family Dictyospongidæ by the discovery of new genera and species, were examined with great interest by the fellows present. The Dictyospongidæ include forms that aroused much discussion when they were first discovered, which were called hydnoceras by Conrad, in the belief that they belonged to the cephalopods, but were named dictyophyton by Hall, because he thought them to be plants. Later discoveries proved the existence of siliceous spicules, and showed the true position of the strange organisms to be with the hexactinellid sponges. In discussing this paper Sir William Dawson pointed out that though these sponges are confined to the Devonian in New York, they have been found as far back as the Cambrian in Canada.

After the noon recess Professor Alexander Winchell occupied the chair in the absence of the president. The first paper on the programme was by Professor G. K. Gilbert, on "The strength of the earth's crust." The treatment of the subject was mathematical and theoretical. The author's observations were made largely in connection with tracing the history of the Quaternary Lake Bonneville in Utah. From the phenomena of that locality and elsewhere, Professor Gilbert deduces the theory, which he holds only tentatively, that mountains are sustained by the strength of the earth's crust, while broader elevations, such as continents and continental plateaux, are sustained by virtue of the fact that such parts of the earth's crust are of lower specific gravity than those beneath the oceanic depressions. This communication naturally aroused some discussion among the fellows, the general tenor of which seemed to be that the strength of the crust was greater than Professor Gilbert's calculations made it.

In the absence of Professor Joseph Le Conte, his paper "On the origin of normal faults and of the structure of the basin region" was read by Professor J. J. Stevenson, the secretary of the society. Normal faults are those in which the downthrow of the strata is on the upper side of the plane of faulting or hade. Professor Le Conte would assign these faults to the oscillations of a somewhat mobile crust floating on a liquid interior. Without discussing this communication, the society passed to President T. C. Chamberlin's paper on "Bowlder belts distinguished from bowlder trains; their origin and significance." This gentleman has made especial study of the glacial geology of this country for the U. S. G. S., and probably knows more about the drift than any one else in the land, so that his remarks were listened to with great interest. He said that for obvious reasons bowlders were among the first phenomena of the drift to attract attention, but afterward study was diverted to other phenomena of this formation. Recently, however, much work has been done on bowlders. Bowlder trains had their origin in knobs or prominences of rock which gave off fragments as the ice passed over them. The bowlders decrease in size with the distance from their source, and are arranged in somewhat divergent lines which might appropriately be called bowlder fans. In a particular fan the bowlders are usually of similar material. Bowlder belts lie transverse to the direction of motion of the glacier, and are commonly associated with terminal moraines. Their striking characteristics are that the bowlders are of many kinds of material and that they are superficial and do not mingle deeply with the drift, as do those of the trains or fans. A glacier deposits material in three ways: 1. It pushes matter forward mechanically, ridging it at its edge, forming what may be called push moraines. 2. A glacier may fail to carry forward to its actual extremity the material which it is pushing at its base, and this may lodge under the margin, forming a submarginal accumulation, which may be called a lodge moraine. 3. A glacier carries forward the material embraced within the ice or borne on its top until it reaches the extreme margin, when it is dropped, forming what may be called a dump moraine. The bowlder belts are held to belong to the third class. Most of the bowlders in Illinois, Indiana, and Ohio come from the Archæan rocks 300 to 500 miles northward, and are arranged in belts.

Professor C. D. Walcott's paper on a "Study of a line of displacement in the Grand Canon of the Colorado, Arizona," was read next. It was well illustrated by maps and diagrams, and showed how the dip of horizontal rocks might be made almost vertical near displacements or faults. Following this was an elaborate and valuable paper by Professor J. F. Kemp on "Trap dikes near Kennebunkport, Me.," which gave the results of much careful work in the field and with the microscope.

Papers by Messrs. J. S. Newberry, J. W. Spencer, D. Honeyman, and P. Neff were read only by title, and one by Mr. E. O. Hovey was referred to section E for reading. The Geological Society of America then adjourned to meet in the American Museum of Natural History, New York City, on the 26th of December next.

E. O. HOVEY, Ph.D.

Free Baths at Milwaukee.

Milwaukee is never behind in anything, not even when it comes to a public natatorium. The new free bathing establishment has been completed and turned over to the city.

The building, which is located on Prairie Street, near Seventh, is a handsome structure, and is very conveniently and neatly arranged, says the *Evening Wisconsin*. It is a solid brick building with stone trimmings. The visitor enters the building in the front, passing through a short hall between two rooms into the natatorium. A wide walk leads around the tank, which occupies nearly all the ground floor space. The tank is about 3 feet deep in front, the bottom sloping to the rear, where it is 9 feet deep. It is 32 feet 6 inches wide and 80 feet 6 inches long. Long lines of steam pipe run along the walls above the ground floor to heat the building, and above them are rows of ventilators. Two tiers of galleries run around three sides of the building, which are reached by eight flights of stairs. Each gallery on the sides is filled with a line of dressing closets, while the galleries at the rear end are fitted up with shower baths.

There are 108 of the dressing closets and 16 of the shower baths. The baths on the outside are counterparts of the dressing closets, but are different on the inside. They have zinc floors and the rose is elevated slightly above the top of them. Warm and cold water can be showered at the will of the bather.

Light is obtained through a long skylight running down the center of the roof. Closets of improved pattern have been arranged in a room to the left of the entrance. The room at the right of the entrance will be used for the office. On the second floor, at front of the building, is a suite of rooms for the janitor. A big boiler in the rear will furnish the steam to warm the building and the hot water to warm the water in the tank.

RELIEF OF DEAFNESS IN OLD AGE.—Sapolini, of Milan, has described a method of his which he states he has successfully employed in sixty-two cases of deafness of old age. It consists in mopping the membrana tympani with a weak oleaginous solution of phosphorus. He claims that the treatment diminishes the opacity of the membrane, increases the circulation, and improves the hearing.—*Kansas City Medical Index.*

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[SPECIAL CORRESPONDENT OF THE SCIENTIFIC AMERICAN.]

THE PARIS EXHIBITION.

PARIS, August 25, 1889.

I hear from many quarters that there is great satisfaction at the sales of machine tools by the exhibitors. Some, indeed, have sold nearly the whole of their exhibits—an example in point being G. Lomont, who has sold a dozen machines out of the thirteen he exhibited. Wm. Sellers & Co., of Philadelphia, Pa., have sold their tool-grinding machine and their twist drill grinder to the Northern R.R. of France. Warner & Swasey, of Cleveland, Ohio, could have sold their exhibited machine two or three times over if they had a good attendant interpreter in charge, and it seems a great pity that so fine an exhibit should be left without anybody to show it.

There are very few machine tools shown at work in the exhibition, I am sorry to say, those of J. A. Fay & Co. and Wm. Sellers & Co. forming the praiseworthy exceptions. There are plenty of visiting mechanics here who have used twist drills, but never appreciated the advantages of a twist drill grinding machine until they saw one ground on the Sellers machine and put to work in this exhibit. The fact is that grinding a twist drill correctly by hand is one of those things that cannot be done, no matter what the experience or how skillful the mechanic. Sometimes one cutting edge only will cut. At others, each cutting edge will cut for a part only of its length, the amount of the clearance will be variable on the two cutting edges or at different points along the same cutting edge, and so on. But in the Sellers exhibit one sees that from the moment the drill point begins to cut, two distinct shavings of equal thickness and length are cut, and their strength is such that they will remain intact while emerging five or six inches from the mouth of the hole, and require quite some force to break them, whereas a badly ground drill will break up the shavings or chips, doing less work, and requiring more power to drive.

In an exhibit by P. Hure, of Paris, I find some milling cutters in which the front face, instead of being a radial line, has rake given to it, by making its plane on a line behind the center, after the manner of the teeth of a skew bevel gear wheel. For wrought iron, cast iron, or steel this is doubtless an advantage, but it is decidedly detrimental if the cutter is to be used for brass work. In this same exhibit I found a lathe in which, the slide rest being of the usual square top pattern, the tool is clamped to the underneath face of the square top, thus making the top surface of the tool steel the base from which the height of the tool steel with reference to the work is determined. The tool is held to the rest by two clamps, each having two screws. One of these screws (that nearest to the tool) passes through the top of the slide rest, and threads into the clamp, while the other threads through the top of the slide rest, while its point acts against the clamp. The first named is screwed up to lightly grip the tool, and the other is then screwed up, causing the clamp to act on the tool as a lever whose fulcrum is the front screw.

This is of course a very firm method of gripping a tool, being, in fact, that employed on what is known here as the Maudslay slide rest. It has not found favor, however, in the United States, and is not likely to do so, because it can only be applied to a compound slide rest, and small lathes are much better, if made on the American plan (as pointed out by me in a previous article), without any compound rest. While on this subject, let me say that the objectionable feature of the upper slide of a compound rest coming so close to the back head of the lathe that the upper feed screw of the rest cannot be worked without taking its handle off at every half revolution, is overcome in two exhibits here by the employment of a pair of gear wheels, one of which is on the end of the feed screw, and the other geared into it, the band being on the shaft of the lathe, and hence thrown out toward the workman. In one of these devices the gears are of equal diameters, while in the other, that on the feed screw is twice the diameter of that which the handle drives. The latter is, I consider, preferable, because it throws the handle well out from the tail stock of the lathe, while it enables the slide to be fed very finely to the cut.

In the exhibit of E. & P. H. Bonhey, there is a lathe in which what is usually the live center is a fixed dead center, a plan that certainly insures true work, whatever disadvantages in other respects it may possess.

On some of the small lathes for fine work the fit of the slides to the slide rest ways are made by gibs of brass or bronze, a plan adopted by Holtzaphel in his expensive lathes. My experience is, however, that cast iron is a better and more durable material, because the duty is not sufficiently heavy to cause the surfaces to cut, hence the cast iron gets a hard glaze that prevents wear. It must not be forgotten too that these gibs are right under the eye of the operator, hence their lubrication is not likely to be neglected or forgotten.

A point that seems to be overlooked in most slides and sliding heads is that there is, if the top face of the slideway is left a full plane surface, the sliding rest is sure to get loose in the middle, because it is more used there than at the end of the slide, and it becomes obvious that instead of the surface in contact being greatest at the end of the slide, it ought to be the

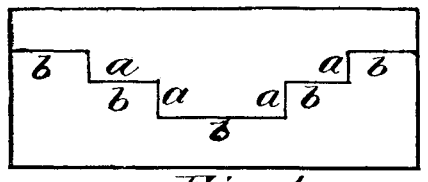

Fig. 1.

least there, so as to equalize the wear. This is accomplished in one of the exhibits here by recessing down the slide faces at the ends, making the width of bearing at the ends rather less than it is in the middle of the slideway length.

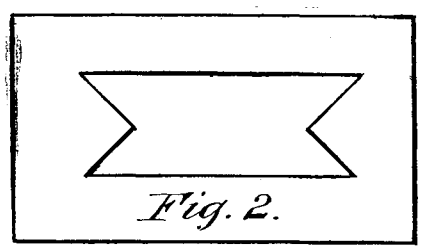

Fig. 2.

My attention has been called to the samples of vise work exhibited by the French technical schools, and the following examples will give an idea of the whole and show their applications in practice. One of the simplest of these exercises is shown in Fig. 1, in which

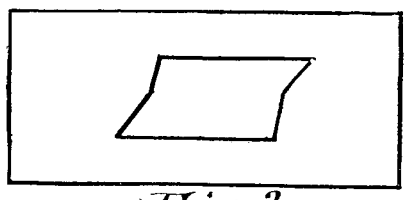

Fig. 3.

the bedding of the surfaces *b* is an easy operation, but the fitting of the parallel faces *a* requires considerable skill. Figs. 2 and 3 are examples in the fitting of dies in connecting-rod straps, such as have already been referred to and illustrated in my previous letters. Fig. 4

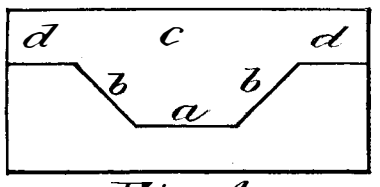

Fig. 4

is an example such as is met with in bedding the brasses of pillow blocks and locomotive axle boxes, and teaches that the patterns for such work should be so made or shaped that the surfaces *a* should, when the first bedding contact occurs, be quite clear of bedding,

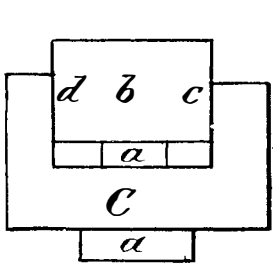

Fig. 5.

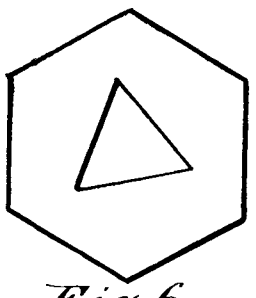

Fig. 6

or, in other words, that the surfaces *b* should not meet when surfaces *a* come into contact. The reason for this, the student soon discovers, is that it requires more metal to be cut off *a* and to let the top piece *c* down a given distance than it would be required to cut

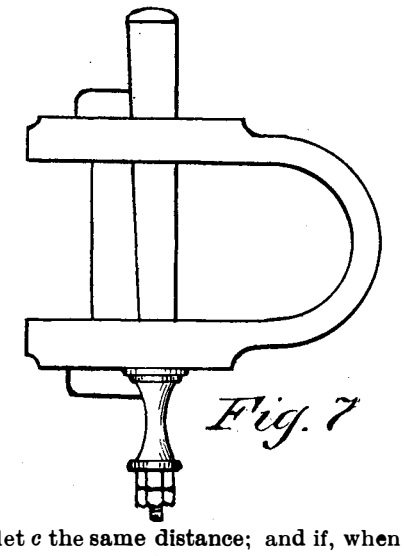

Fig. 7

off *b* to let *c* the same distance; and if, when bedding first occurs, it is at *b*, then but little will require to be taken off *b* to let *a* and *d* come into contact. This is a point often overlooked by pattern makers when making the patterns, and by fitters or vise hands when fiting such pieces together. Fig. 5 is an example in which *a* is a bolt whose head *b* fits into a recess in C, and unless the sides *c*, *d*, bear with equal force of contact, the body of *a* will bind in C, and there will be a tendency to cause the head of *a* to bed unfair. Fig. 6 is a nut with a triangular hole passing through it, and from it the student learns how difficult it is to file up a true hexagon, and also to file out a triangular hole without cutting too deep into the corners. Triangular files with a safe edge are rarely kept, save in shops where very small work is done, and it is a frequent occurrence for the workmen to have to grind the teeth off one face of file in order to get a sharp corner to file out the triangle corners with. Fig. 7 is a strap key and gib for a connecting rod, and illustrates the point mentioned in one of my former letters that the French and Belgians sometimes use much less taper on their connecting-rod keys than is the practice in either America or England. As a natural result of this it takes more downward motion of the key to take up a given amount of wear, hence the employment of the piece or sleeve *a* in the figure, which takes up the length occupied by the long thread on the key end.

JOSHUA ROSE.

The Porpoise.

The French *Journal Officiel*, says *Nature*, recently contained a report which Prof. Edmond Perrier had sent in to the French government on the subject of the best means of protecting fishermen against porpoises. Although the depredations of these creatures have been exagerated, it is certain that they do considerable damage, especially on the Mediterranean coasts of France, by tearing the nets. For at least a quarter of a century past efforts have been made to lessen the numbers of the porpoises by offering a reward per head and by other remedies. In 1865 the government invited the fishermen themselves to organize a seine net fishery for porpoises, and they were offered special nets, and sums of from 5 to 25 francs for each animal. It was, however, found in practice, that as soon as the porpoises felt themselves to be surrounded, they simply jumped over the seine nets and were at large again. Some years later the fishermen of Cannes, Saint Tropey, and La Ciotat petitioned government to lend them a gunboat, filled with torpedoes, for the purpose of firing at the porpoises. This was done, and the cannon and the torpedoes scared away the porpoises for about eight days, but they scared away the fish as well, so that there was no fishing for at least a week. The porpoises, moreover, are too numerous and too agile to be shot, one by one, in an effective manner. The report sums up that the employment of artillery against porpoises is perfectly useless, that a reward for killing them singly is equally unavailing, and that the only thing to do is to encourage the fishermen to unite in chasing the porpoises, and in forming a mutual insurance guarantee against their depredations. In the meantime the Department of the Marine might continue to indemnify, to a certain extent, the proprietors of any nets that have been very seriously injured.

Electric Car Lamp.

One of the latest novelties in the application of electricity consists of an electric reading lamp, which is being fitted to the carriages on the main line of the Southeastern Railway. It is on the principle of the "put a penny in the slot" automatic machines. The apparatus is situated immediately over the passenger's head, and under the rack, and is contained in a small box 5 inches by 3. The light is of five-candle power, and is obtained by the introduction of a penny at the top of the box, and by a subsequent pressure of a knob, and will last for half an hour, extinguishing itself at the end of that time automatically. If the light be required for an indefinite period, a penny every half an hour will suffice. The light can be extinguished at any moment by means of a second button provided for the purpose. One of the special features of the invention is that, if the instrument is out of order, the penny is not lost, as it is in the present machines. It drops right through, and comes out at the bottom of the box, so that it can be recovered, and the same result happens in the case of any coin other than a penny. Each carriage is fitted with an accumulator which supplies the electricity. This invention, so *Nature* says, will add greatly to the comfort of passengers during night journeys.

Progress of Beet Sugar.

Already more than half the world's sugar is derived from European beet root. Science, chemistry, and mechanical skill have combined to transfer the habitat of a prime necessity of life from the tropics, where only it was supposed it could be produced, into the northern latitudes. Science has shown the way to prepare the soil for it, has overcome all the mechanical problems necessary to the extraction of the sugar, made its cultivation profitable, and given employment to tens of thousands of wage earners, and all this within the last twenty years. The future of this great industry seems almost boundless in its possibilities.—*Tribune, Chicago.*

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RECENTLY PATENTED INVENTIONS.

Engineering.

LOCOMOTIVE. — James Des Brisay, Vancouver, B. C., Canada. This locomotive has two high pressure cylinders, both controlled by a rotary valve, a passage from which leads to the smoke box, and a low pressure cylinder to which a passage leads from the rotary valve, with other novel features, designed for the more economical use of steam, and to condense it and return the water of condensation to the boiler if desired.

FEED WATER PURIFIER FOR BOILERS. —Ludwig H. Thielmann, Brunswick, Germany. A pipe is connected with the lower part of the boiler and extends through the furnace or flue to a vessel arranged above the water level of the boiler, another pipe connected with this vessel extending into the water space of the boiler, whereby a circulation is maintained in the vessel or purifier which carries the water upward thereto, deposits the impurities, and returns the water to the boiler.

STEAM GENERATOR.—Doc W. Fletcher, St. Louis, Mo. This is a water heater formed of vertical transverse spaced sections having longitudinally extending interlocking pockets forming zigzag flues, designed to use a minimum amount of fuel with large heater capacity, and provide independent water heaters for each radiator or each section of a building.

Mechanical.

PULLEY.—Nathaniel P. Smith, Memphis, Tenn. This invention covers a combination, with split pulleys, of pivoted and adjustable spider sections constructed with opposite partial hub portions, whereby the pulley may be adjusted to large or small shafts without a bushing, or may be adjusted to run true when the shaft is eccentric, or may be eccentrically fitted if desired.

GAUGE.—Thomas E. Cassidy, Hoosick Falls, N. Y. This is a combination tool capable of quick and easy manipulation for use as a surface, scratch or depth gauge, with clamp and scriber arms which may be used alone as dividers, as a compass, or as inside or outside calipers, and as trammel points.

DECORTICATOR FOR RAMIE, ETC. — Michel J. Leruth, New Orleans, La. This machine has a pair of fluted rollers adapted to crush the stalks and stems, points to receive the crushed fiber, decorticating cylinder with teeth and beater ribs, rotary brushes for cleaning the fiber as it is carried forward by the cylinder, a brush for removing the cleaned fiber cylinder, etc., being designed to efficiently decorticate dry fibrous plants in large quantities.

PLAITING MACHINE. — William B. Jones, administrator of George C. Parker, deceased, Paris, Tenn. A perforated metallic sheet with textile facing piece is secured to an open frame, to the forward edge of which is hinged a metallic frame, the material to be plaited being placed over the textile facing piece and the plaits turned with the ordinary knife, when the frame is thrown over the ironing board, the plaits moistened, and a hot iron passed over them.

RING SPINNING MACHINE. — Ernst Gessner, Aue, Saxony, Germany. This invention relates to spinning machinery with a driven spindle and traveler rotated by the strain of the thread seated on and carried up and down by a ring, the winding being accomplished by the difference in speed between the spindle and the winder lagging behind, the object being to adapt this class of machines to yarns of little strength.

SPINNING MACHINES.—The above inventor has likewise obtained three additional patents on spinning machines, the first referring to spindles with rotary winders rotated similarly to travelers in ring frames, by the tension strain of the thread, for continually spinning and simultaneously winding the thread, an arm carrying the thread guide being pivoted or hinged in the plane of the spindle, to allow of its being rotated round the spindle, and oscillated between the spindle and the outer circle of its rotary motion from the forces of centrifugal action and the tension of the thread; the second patent embracing a winder consisting of an arm or bow carrying the thread guide attached to a socket or disk encircling the spindle below the cop, and capable of being oscillated in its motion round the spindle, the socket-bearing part of the winder being in frictional contact with the spindle—while by the other patent the arm or bow connected with the thread guide has its upper and lower ends held and carried on the spindle above and below the cop, so as to be in frictional contact therewith, the winder being rotated not only by the strain of the thread, but being aided by friction from the spindle, diminishing the tension, and permitting soft or slack twisted yarns of short or poor material to be spun on the bare spindle.

Agricultural.

HAY BINDER. — Ephraim R. Kugler, Kingwood, N. J. This binder consists of a post adapted to be set vertically in the load, and on which wind ropes secured at their ends to the wagon and passing over the load, with a lever for turning and locking the post, so as to wind the ropes, thereby quickly and securely binding the load of hay to the wagon.

STACK FASTENER.—William L. Murdy, Albia, Kan. In carrying out this invention the stack is made longer than it is wide, and stakes are inserted therein in three lines, at the top and sides, a rope being passed through apertures in the outer ends of each line of stakes, and the ends of the ropes brought together at each end of the stack, where a weight is suspended from them.

SOD CUTTER. — Lewis T. Price, Endicott, Washington Ter. The frame of this sod cutter is mounted on wheels, and carries cutting disks, there being means for raising and lowering the frame, and locking it in the position to which it is adjusted, the construction being specially designed for cutting heavy soil on which "nigger wool grass" grows, with many hard and heavy roots that are hard to cut.

RICE HULLING MACHINE.—Arthur A. Bourgeois, Ariel, La. This machine is made with two corrugated plates facing each other, an agitator extending from one plate up through the hopper, in connection with which a slide or trap is arranged, and one of the corrugated plates being connected with a crank shaft, the machine being simple, cheap, and durable.

Miscellaneous.

SHUTTER FASTENER. — Lewis Whitehouse, Easton, Md. This device has a catch plate combined with a centrally pivoted hook, a rod extending through the wall, and having its inner end passing through an apertured end of the hook, a spiral spring being employed, whereby the shutter fastens automatically when opened and is unfastened from the inside of a room by pressing a knob in the wall at one side of the window.

WIRE TIGHTENER AND SPLICER. — Shapley P. R. Taylor, William T. Sharman, and Joseph L. Jamison, Denison, Texas. This device consists of a disk slotted to form wings, the points of which are bent up out of the plane of the disk, with a perforated stem, and adapted to be rotated to secure it in position, the disks being cheap and light, and left permanently on the wires, where they are applied with a hand lever.

END GATE FOR WAGONS.—Samuel J. Mason, Mead, Neb. This device is made with a flat hinge plate called the gate hinge plate, and a combined re-enforcing and hinge wagon plate extending the full width of the rear end of the wagon, and serving also to protect the rear end of the wagon body from wear, in combination with levers pivoted to the wagon body, and connecting rods pivoted to the gate and to the levers.

LUMBER WAGON.—William and John H. Leonhardt, Baltimore, Md. The main frame of the wagon body has a windlass mechanism, and there is a supplemental frame with movable bearing connected with the windlass mechanism, whereby the body may be extended and adjusted for supporting lumber of different lengths, and its forward end elevated for the ready discharge of lumber at the rear end of the wagon.

FOLDING CRATE.—James W. Brook, Lynchburg, Va. The end sections of this crate are hinged to the bottom, and a hollow ventilating partition is provided, serving to divide and give strength to the box, while eyes or staples are arranged on the inner sides of the end uprights to be connected by hook rods extending diagonally between the front and rear sides, the crate when ready for use presenting the appearance of an ordinary crate with hinged top.

BASKET.—Irwin H. Spelman, Cortland, Ohio. This is a splint basket composed of two series of interwoven splints formed into polygonal shape, and having at the corners re-enforcing splints whose lower ends are interwoven with and placed upon the main splints of the basket body at the lower corners, while the upper ends are extended between the divergent main splints of the basket body to fill the interstices.

COMBINED TABLE AND CHAIR.—Willie O. Whitney, Glens Falls, N. Y. This invention provides an article of furniture which may be used interchangeably as a table or chair, the chair back being adapted to form the table top, and the different adjustments being readily effected.

PADDED HAT. — Jesse H. Moyer, Temple, Texas. This invention provides a strip of fibrous material to be placed between the sweat band and body of the hat, and having hooks projecting from one edge to engage the body of the hat and hold the pad or strip in position, whereby a hat that is too large can readily be made to fit.

DRAPERY TRIMMING. — Paul Gumbinner, New York City. This is a fabric trimming for draping furniture, clothing, etc., and is made of woven fabric, sacks or bags, connected at one end in a series to a suspensory band, and gathered or shirred at their free ends, and provided with pendent tassel ornaments.

CORSET CLASP.—John M. V. Le Beau, New Orleans, La. This clasp consists of two spring steel or elastic busks, a lower fastening device, and a series of upper fastening devices, all of the fastenings being held to the face of the busk, and engaging headed pins or buttons which are fixed to the busk to lock or clasp the corset to the body of the wearer.

TOY.—George W. Nusbaum, Lehighton, Pa. This toy consists of a flanged board with certain points thereon separately marked by different colors, balls or marbles bearing also corresponding designations, and the board having depressions and pockets around its edges, with balls or marbles corresponding to these pockets, the depressions and pens defining the portion of the board to which the different marbles belong, and to which they are to be brought without directly moving them with the fingers.

ICE PITCHER. — Edward Playter, Ottawa, Ontario, Canada. This is a pitcher in which water, milk, etc., may be cooled without the ice being brought in contact therewith, the pitcher being provided with internal sockets, and an ice receptacle being provided with trunnions adapted to be journaled in the sockets, the ice receptacle being readily removable from the pitcher when desired.

APPARATUS FOR DELIVERING COAL, ETC.—Charles S. Schenck, New York City. This is an apparatus more particularly for discharging and conveying materials from vessels to various points, or for use in factories or other structures, an endless belt conveyer discharging into a well or pocket, in combination with a bucket elevator lifting the material from the well, and a chute receiving the material and delivering it to an upper trough in which the conveyer belt works.

CISTERN CLEANER. — William A. Palmer, Plymouth, Mich. This device has a hollow body with an open lower end, to which a plate having an inwardly opening valve is adjustably hinged, with adjustable legs, and a tube with stopper extending from the upper end of the body, the device being capable of ready manipulation for cleaning a cistern without fouling the water it contains.

BOTTLE STOPPER. — Finley Y. Clark, Saratoga, N. Y. Combined with the stopper head and the bottle head is a bail pivotally mounted at the bottle head to swing above and against the top of the stopper head, to hold the stopper in place, a lifting lever pivotally engaging the stopper head and the bail, the device making a convenient stopper for bottles designed to contain aerated waters or liquids of any kind.

ENFLEURAGE. — Gysbert D. Nellensteyn, Amsterdam, Holland. This invention relates to the treatment of flowers and other substances containing ethereal or volatile oils and aromatic parts, and covers a vacuum process for obtaining therefrom pure perfumes or extracts by a single operation in a cheap, simple, and easy manner.

PLUMB BOB. — John M. Cameron, Philadelphia, Pa. This bob is axially bored, and a point inserted in the bore adapted to be extended or withdrawn, the bob also being provided with a clamp for holding a needle point, and a needle fitted thereto, whereby the point is readily adjustable to adapt it to different kinds of work.

PALLET FOR DRYING BRICK.—Charles T. Fitch, Elizabeth, N. J. Combined with the heads united by horizontal connecting bars is a bench horizontally supported upon the heads and secured to the connecting bars, the invention being an improvement on a former patented invention of the same inventor.

SCIENTIFIC AMERICAN BUILDING EDITION.

SEPTEMBER NUMBER.—(No. 47.)

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2. Plate in colors of a residence recently erected at Natchez, Miss., from plans prepared by Messrs. Munn & Co., architects. Perspective elevation, floor plans, details, etc.
3. A ten thousand dollar residence recently erected at Bridgeport, Conn. Perspective elevation and floor plans.
4. A very attractive cottage for six thousand dollars erected at Jersey City Heights, N. J. Floor plans and perspective elevation.
5. Engraving of the U. S. court house and post office at Savannah, Ga.
6. A house at Woodlands, Sevenoaks.
7. Church of the Angels, Los Angeles, Cal.
8. A cottage recently erected at Jersey City Heights, N. J., at a cost of seven thousand seven hundred dollars. Plans and perspective.
9. A house for five thousand five hundred dollars at Jersey City Heights, N. J. J. C. Markham, architect. Elevations and floor plans.
10. A modern house at Bridgeport, Conn., built at a cost of six thousand six hundred dollars. Plans and perspective elevation.
11. A block of six apartment houses lately erected at Bridgeport, Conn., at a cost of five thousand dollars each. Henry Lambert, architect. Floor plans and perspective elevation.
12. A Queen Anne cottage recently built at Englewood, N. J., at a cost of three thousand dollars. Perspective elevation and floor plans.
13. A dwelling for thirty-five hundred to thirty-eight hundred dollars, recently erected at Bridgeport, Conn. Plans and elevations.
14. Perspective view and plan of the new depot recently erected by the Northern Railroad, at Englewood, N. J.
15. A London fire engine house. Cost six thousand dollars. Elevation and ground plan.
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Notes & Queries

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Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information, and not for publication.
References to former articles or answers should give date of paper and page or number of question.
Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all, either by letter or in this department, each must take his turn.
Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.
Scientific American Supplements referred to may be had at the office. Price 10 cents each.
Books referred to promptly supplied on receipt of price.
Minerals sent for examination should be distinctly marked or labeled.

(1263) L. R. asks how to make the luminous substances used for match safes, bell push buttons, etc., to make them show in the dark. A. For Balmain's luminous paint we refer you to our SUPPLEMENT, Nos. 229 and 497, which we can send by mail for 10 cents. 2. How to clean a plaster of Paris statue. A. Plaster of Paris casts can be cleaned by careful brushing with a little ground pumice stone or other detergent. Organic spots can sometimes be removed by painting with turpentine and water and exposing to the sun under glass.

(1264) W. G. C. asks: Is there any danger of explosion in a hot water coil in cooking stove, by the pipes becoming choked up with sediment or formation of scale? The water makes very little scale in kettle used for boiling water. A. There is a possibility of the pipe becoming closed where hard water is used, and it may then burn out. There is very little danger with an open boiler. Make the coil longer or larger. 2. Will copper studs placed in coil pipe assist in heating the water? If so, what size and how should they be put in? Pipe is ¾ in. inside and about ⅛ in. thick. A. Copper studs will not pay for the trouble of putting in.

(1265) E. S. L. asks if there is any way in which a handle, broken from a cast iron skillet, can again be welded or fastened to the skillet. A. It can be attached by riveting a strap to body and handle. Usually the metal is so hard that this will not pay, on account of the difficulty of drilling.

(1266) W. D. G. writes: I had occasion some time ago to take out some iron rods which had formed a rack over an opening in a flume. The rods had been constantly under water for some years, but were very little rusted except about three inches of the lower end, which was driven into the planks forming the bottom of the flume. Why should they rust more where inclosed in wood (spruce) than above it, when the whole was constantly covered with water? A. Probably there was some acid reaction upon the iron in contact with wood.

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(1267) T. S. V. asks: In rolling hot iron or steel, does the elongation of the bar take place at the entering side, or at the exit side of the roll, or elsewhere? Does the metal flow forward or backward? A. The elongation takes place along the surface of contact with the rolls. The rod moves from the rolls with the same velocity as the periphery of the rolls inside of the grooves. It approaches the rolls with less velocity than the speed of the rolls, or the metal flows backward in reference to the speed of the roll surface.

(1268) T. H. K., Jr., asks how brass gas fixtures are brightened and lacquered. I have used nitric acid and then dipped them in water, but just as soon as they are exposed to air they discolor again. A. Have the water clean and *boiling* in two vessels. Dip in one water and then in the next as soon as taken from the nitric acid bath, so that there shall be no traces of acid on the fittings. Dry in boxwood sawdust while hot, and place upon a piece of hot sheet iron over a stove. As soon as all traces of water have left, quickly lacquer with very thin shellac varnish, using a camel's hair brush. You can make the laquer by dissolving shellac in best alcohol, or you can obtain a lacquer for such purpose from some of the firms whose cards appear in our advertising columns. Do not touch the metal with the fingers before lacquering.

(1269) St. G. J. asks how to make a cheap pump for supplying water to mains with a 12 horse power engine, pump to lift water 40 feet. A. If you have tools for log boring, a log lift pump is probably as cheap as any. They can be made of 5 in. bore with safety as to pressure. If you wish to utilize the whole power of your engine, we suggest a box made by bolting four planks together so as to make a square bore six inches in diameter, in which a square bucket can be operated. The bucket and foot valve should be made of hard wood and leather, with iron or lead weight on top of the valves. A clever carpenter should be able to devise the details. Operate the pump rod, which may also be of wood, by a bell crank lever in the manner of the Cornish pumps.

(1270) S. asks: 1. Is the atmosphere lighter or heavier in damp weather? A. Lighter for a given volume. 2. Is the atmosphere the lightest just after a rain? A. No. 3. Has the atmospheric pressure any effect on the barometer? A. Yes; the barometer has for its object the measurment of this pressure. See Meteorology, by Loomis, mailed by us for $1.75.

(1271) R. asks how to keep tin from being rough or lumpy on articles plated by the dipping process. Also what temperature molten tin should be kept. A. Put a little clean tallow upon the surface of the melted tin when dipping. Make the tin just hot enough to give a clear, shining surface.

(1272) J. H. B. asks how to melt gold which is amalgamated with quicksilver, so as to pour into moulds in the form of bricks. A. If you undertake to melt the gold amalgam in an open crucible, you will lose the mercury by evaporation. The proper way is to place the mass in a retort, sealed tight with clay, with a pipe leading downward from the top of the retort in a receptacle for the condensed mercury. Heat the retort over a furnace to about 660°, when the mercury distills over into the receptacle. The contents of the retort can be placed in a black lead crucible, melted, and poured into an ingot of gold.

(1273) T. S. asks a formula for making solution for coating small iron castings with copper? A. Such deposits are generally wanting in lasting qualities, since they are too thin to protect the iron from atmospheric influences. Dip the articles in a solution of sulphate of copper 3½ oz., sulphuric acid 3½ oz., water 1 to 2 gallons, and it will give them a coat of pure copper. If the articles remain a few minutes in the solution, the deposit becomes thick and muddy and does not stand any rubbing. Small articles are sometimes coppered by jerking them about in sawdust impregnated in the above solution further diluted with water.

(1274) "Crescent."—We know of no better way to make snow by an ice machine than by placing coils of pipe on the walls of a room and circulating the brine in the coils. Feed the room with moist air, which will congeal upon the pipes as a light frost; by scraping this off you will have an approach to artificial snow.

(1275) J. M. B. asks: Is pure aluminum as good a conductor of electricity as platinum? A. It is a better conductor. 2. May it be used in the manufacture of electrical instruments instead of platinum? A. It may where it is not exposed to heat or to the action of the spark of the extra current, etc.

(1276) J. S. O. asks whether a good ball batter with the same force in the stroke can knock an easy or slow ball further than he can a swift or hard ball? A. We should say the slow ball would be sent the farthest, and that a ball batted from a state of absolute rest, if that were practicable, would go farther still, equal force being in the bat in each case.

(1277) T. H. R.—We know of no difference between a marine glass and a field glass. The white of a man's eye is a very uncertain test for a field glass. Try the dial of a watch at 500 yards, and see if you can tell the time. Good field glasses single may be had from $5 to $10. Double from $10 to $15. The ordinary power of the Lick telescope is from 300 to 2,000 times. Divide two miles by these numbers for the distance.

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INDEX OF INVENTIONS

For which Letters Patent of the United States were Granted

August 27, 1889,

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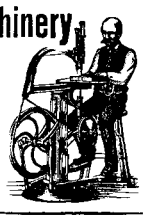

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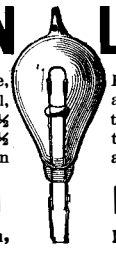

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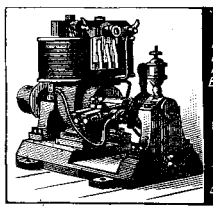

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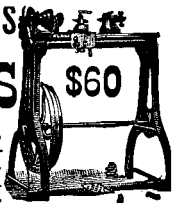

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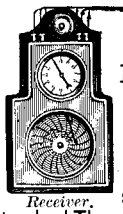

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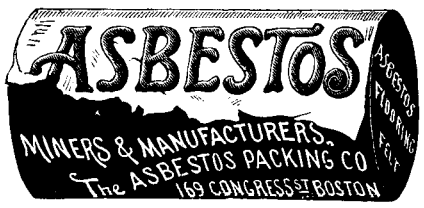

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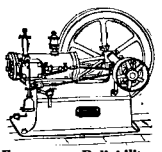

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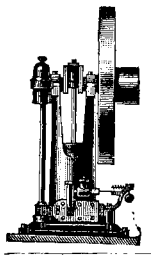

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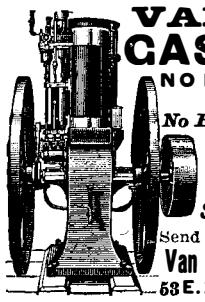

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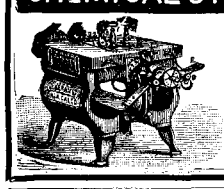

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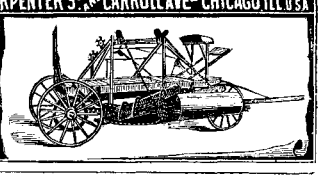

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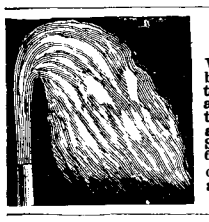

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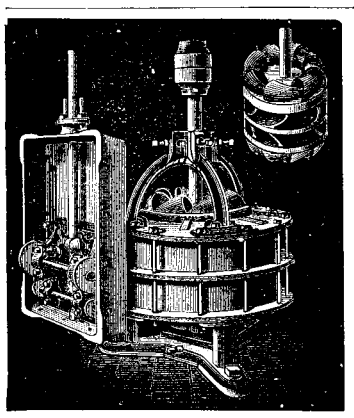

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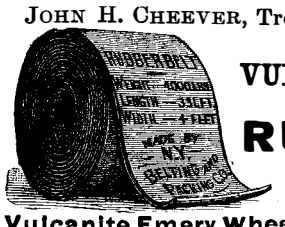

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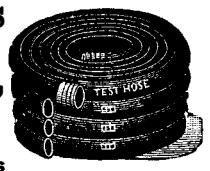

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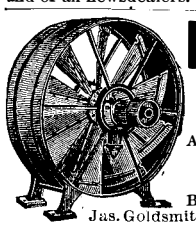

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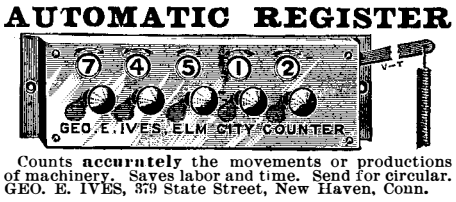

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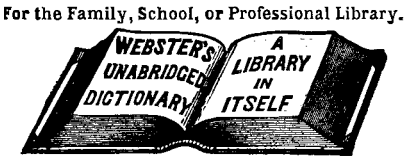

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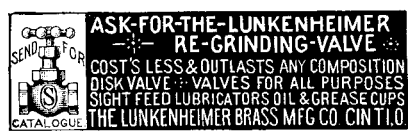
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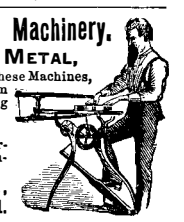

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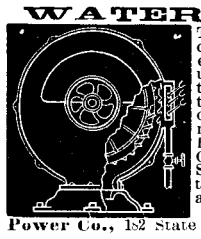

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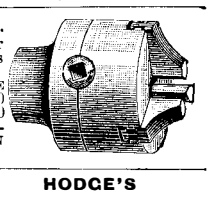

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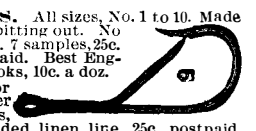

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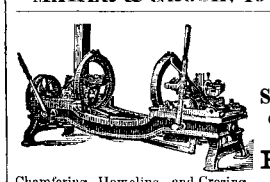

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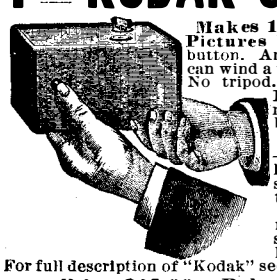

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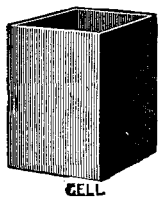

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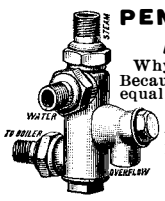

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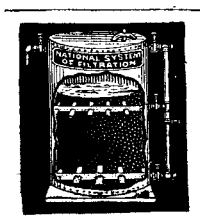

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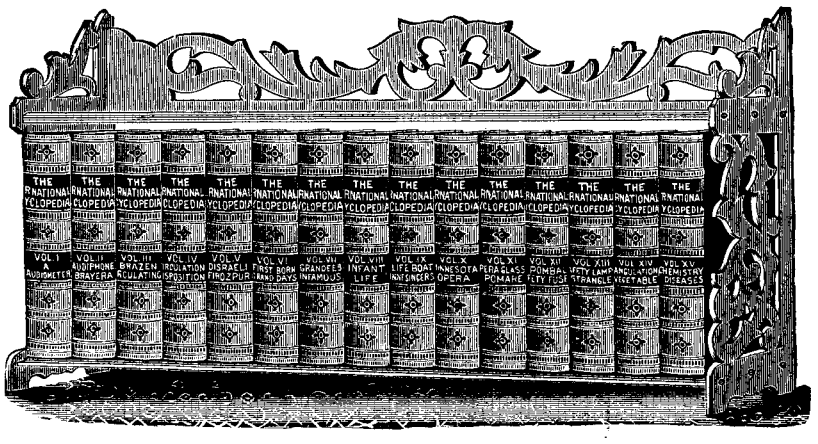
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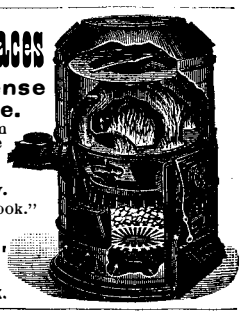

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